MODERN PLASTICS

OCTOBER 1952

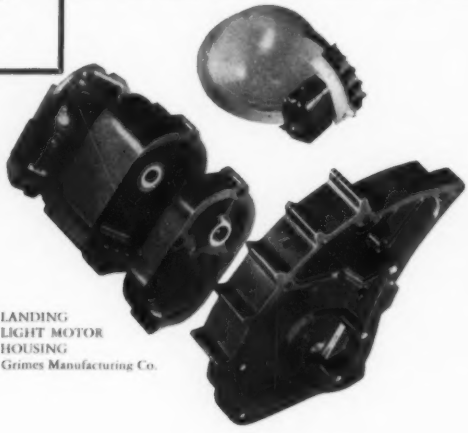
Want some new ideas on WEIGHT SAVING?

FLOOR POLISHER HOOD
Shetland Company, Inc.

AIR CONDITIONER PARTS
York Corporation

HEAVY-DUTY SOLDERER
Phillips Manufacturing Co.

Your custom molder can help...with DUREZ phenolics



LANDING LIGHT MOTOR HOUSING
Grimes Manufacturing Co.

● When light weight calls the turn in your selection of materials...and more and more it *does* these days...weight-saving is seldom the sole factor.

Here are four examples that show how other manufacturers are obtaining, in molded phenolics, the light weight plus the *other* characteristics they want in large and small units.

In the air conditioner slinger rings, costly machining of the material formerly used was eliminated...the Durez molding is *pre-balanced in the mold.* Being self-insulating, the fan housing needs no separate insulation. The floor-polisher hood is lasting protection against dirt and moisture, absorbs mechanical shocks without nicking or scratching.

Cost is held down in aircraft landing light parts by molding-in all flanges, holes, ribs, and metal inserts. The soldering tool housing resists heat, is safe and comfortable to use.

Production economies, savings in shipping costs, and user benefits are all at your command in those most versatile of all plastics...the phenolics. All along these lines new ideas await your investigation. Talk with your Durez molder...or with our technical staff.

DUREZ

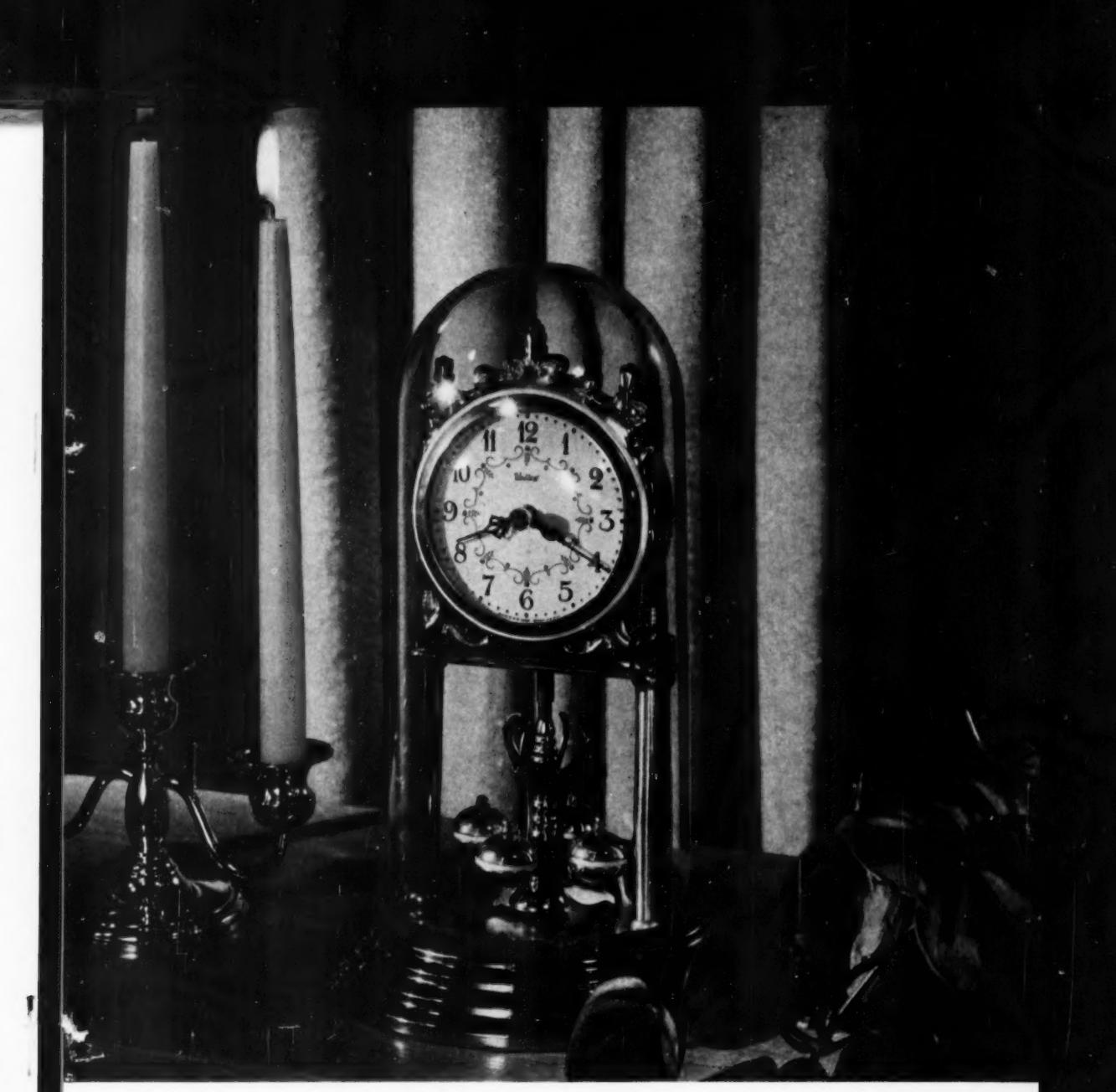
PHENOLIC RESINS

- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

Our monthly "Durez Plastics News" will keep you informed on industry's uses of Durez. Write, on office letterhead.

DUREZ PLASTICS & CHEMICALS, INC.
1210 Walck Road, North Tonawanda, N. Y.

PHENOLIC PLASTICS THAT FIT THE JOB



In referring to *Perpetua*, its 400 Day Anniversary Type Clock, the United Clock Corporation has this to say:

"New, graceful, crystal-clear *Catalin Styrene* dome solves the headache of handling and shipping breakage"

Despite "Handle With Care" precautions, the dome component of this ensemble, originally made of traditional, transparent materials, developed an excessive breakage that necessitated expensive replacements. To solve the situation, the manufacturer's custom molder* advocated strong, lightweight CATALIN STYRENE and then ingeniously engineered a mold capable of faultlessly processing in a 200 oz. injection molding press, the large sized requirement... 11½" high—5½" diam.—⅛" wall. The successful result:—A towering, seamless, clear-view dome that can be handled "without kid gloves". Thus, CATALIN STYRENE, by being so highly proof to breakage, and so desirably low in cost, not alone protects and exquisitely enhances "Perpetua", but also serves many other popular products in the famed United Clock line.

*molded for United Clock Corp., 379 DeKalb Ave., Bklyn, N. Y. by Majestic Molded Products, Inc., 845 E. 138 St., Bronx, N. Y.

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE • NEW YORK 16, N. Y.

CATALIN

In addition to Styrene Molding Compounds, Catalin chemical products include a wide range of Urea, Phenolic, Cresylic, Resorcinol, Melamine and Styrene Resin formulations.

MODERN PLASTICS*

VOLUME 30 OCTOBER 1952 NUMBER 2

CONTENTS

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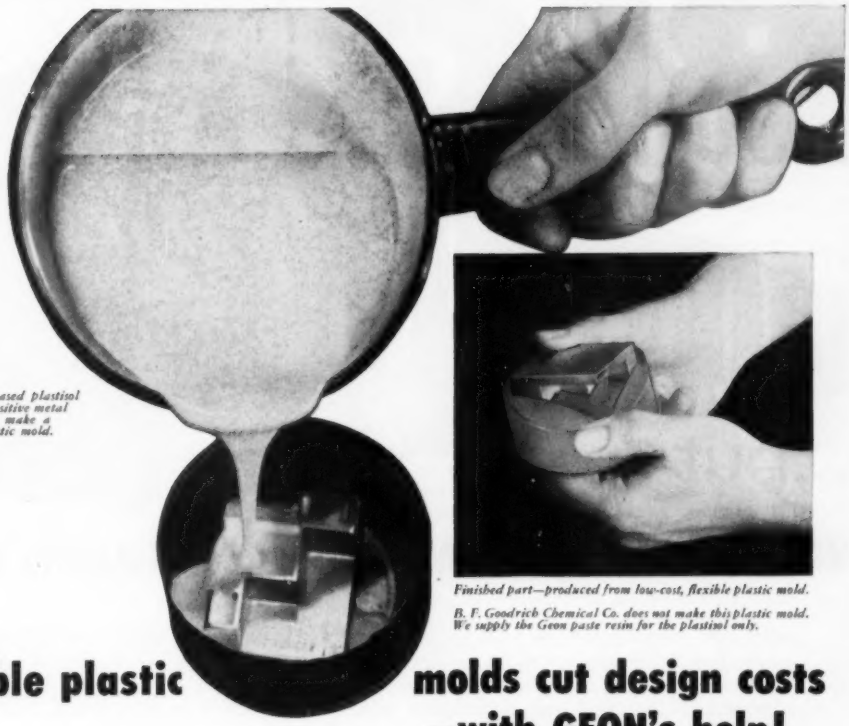
*Reg. U.S. Pat. Office

Another new development using

B. F. Goodrich Chemical *raw materials*



Pouring Geon-based plastisol over master positive metal pattern—to make a flexible plastic mold.

Finished part—produced from low-cost, flexible plastic mold.

B. F. Goodrich Chemical Co. does not make this plastic mold. We supply the Geon paste resin for the plastisol only.

Flexible plastic molds cut design costs —with GEON's help!

MOLDING costs are taking a new cut—with help from a plastisol made with Geon paste resin. The plastisol is simply poured over a master positive metal pattern, covering it completely. After cure and cooling, surplus mold material is cleaned from the underside of the model.

The advantages are many. Plastisol makes the process low in cost—ideal for producing limited quantities of parts where the initial expense of an elaborate metal mold is high. Also, with a flexible plastic mold, the draw can be in several directions—contrasted to a lead mold with a draw in one single direction. As many as 50 phenolic parts—or 10 to 50 polyester parts can be cast before the plastic mold is discarded.

Geon-based plastisols are used in many ways, offer many advantages. They require no expensive mixing equipment—no solvents—no recovery system. They may be used for molding, casting, coating or dipping. They can be made resistant to heat and cold, aging, many chemicals. Perhaps they can help you develop or improve products—at lower costs. For helpful technical information, write Dept. GA-10, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors

EDITORIAL

ABC

At bottom center of this page there is a little colored hexagon containing the letters "ABC." Our advertisers and their agencies are well acquainted with the meaning and value of this mark. But many of our readers may not know its significance; and since, in a way, it represents them, we'd like to tell them about it.

This mark means that MODERN PLASTICS magazine is a member of the Audit Bureau of Circulations, one of 370 business and industrial publications with a combined circulation of 4,944,743. Of the publications serving the plastics field, MODERN PLASTICS is the only ABC member.

The idea of audited circulation goes back to 1914, before which time there was no generally accepted means of measuring a publication's circulation, nor of relating circulation to markets. All advertising space purchasing before that time was based on publishers' competitive claims and on their own statements of distribution. Advertisers wanted to know who read a particular publication, and how much appreciation the readers had for the editorial policy and content. Classification of readers under various industrial interests, it was felt, could best be accomplished by the readers themselves by their statements of their business interests at the time when they purchased subscriptions to magazines. Indication of reader interest could best be determined by a) the number of people who were willing to pay a subscription price to obtain a publication, and b) the number of subscribers each year who were willing to renew their subscriptions.

Under the cooperative association called the Audit Bureau of Circulations, publishers have a standard of value based on the answers to such questions as: Who reads the publication? Where does it go? How much do people pay for it? How many people renew subscriptions each year? Thus the ABC statement, made by independent auditors having no connection with the publication, actually represents the readers of a publication to advertisers and their agencies.

To industrial magazine readers especially, the ABC has brought benefit in improved editorial content. Since the reader must pay a subscription price for an ABC magazine, it has to interest him and serve him well before he will put up his money. And if the reader is to continue as a subscriber year after year, the editors must be on their toes to bring him the latest, most authoritative, and most useful information on the subjects in which he is interested.

A well-planned editorial content results in the continual growth of a publication, and results in that intangible but powerful publication value known as "editorial readership." An ill-planned, slip-shod, or hypocritical editorial job will quickly result in dropping circulation and lowered renewal rates.

The reader is boss!

MODERN PLASTICS is proud to be an ABC member, proud of that little hexagon at the bottom of this page. This symbol says that we have a contract with each and every subscriber to deliver a specific number of issues of a specific editorial character and quality for a specific length of time at a specific price. And only by delivering superior editorial content can we hope to secure that reader's renewal subscription.

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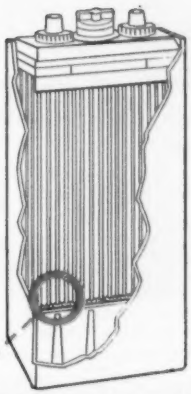
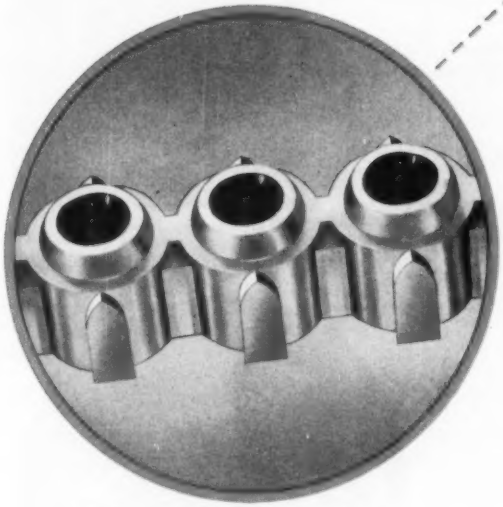


Battery tube sealers of acid-resistant DU PONT "ALATHON"*



Sealers molded for The Electric Storage Battery Co., Philadelphia, by Bachman Bros., Philadelphia, and Amos Molded Plastics, Edinburg, Ind.

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150th Anniversary
Better Things for Better Living
... through Chemistry
Polychemicals
DEPARTMENT
PLASTICS • CHEMICALS

lengthen working life of industrial storage batteries by reducing leakage of active material

A new feature of the Exide-Ironclad industrial battery is positive-plate tube sealers made of Du Pont "Alathon" polythene resin. They reduce the previous low loss of active material by 50% . . . contribute to longer useful battery life. These permanent, non-corroding sealers also insulate the bottom of the plates . . . prevent short circuits.

This is another example of improved performance made possible by the outstanding properties of "Alathon." Its resilience insures a tight fit where the sealers cap the plates—reducing loss of active material and cushioning the plates as well. And "Alathon" is unaffected by electrolyte or electrolytic action. The intricately shaped sealers are economically mass-produced by rapid injection molding.

The excellent electrical, chemical and mechanical properties of Du Pont "Alathon" have led to its use in such varied applications as flexible tumblers, toys, squeeze bottles, and insulation for TV lead-in wire, and police and fire-alarm cable.

Perhaps Du Pont "Alathon" can help you improve or develop a product. We'll gladly suggest suppliers of molded parts or work with you in developing new applications. For full information, write:

E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Department, District Offices:
350 Fifth Avenue, New York 1, New York
7 S. Dearborn St., Chicago 3, Illinois
845 E. 60th St., Los Angeles 1, California

Fiore electroformed metal masks and spraying equipment

Precision-fit Fiore masks often spell the difference between a low cost, first rate paint job and sloppy decorating that costs far more than it ought to. Fiore masks assure sharply defined edges and close registration of colors. They are *engineered* by *specialists* who have designed and built all types of masks for some of the country's leading, most particular molders.

SPRAYING EQUIPMENT—Quality in spray painting plastics depends on having jigs, fixtures, spray guns and booths which allow you to use your masks with maximum efficiency and speed. Fiore spray equipment is engineered to the same high quality as Fiore masks.

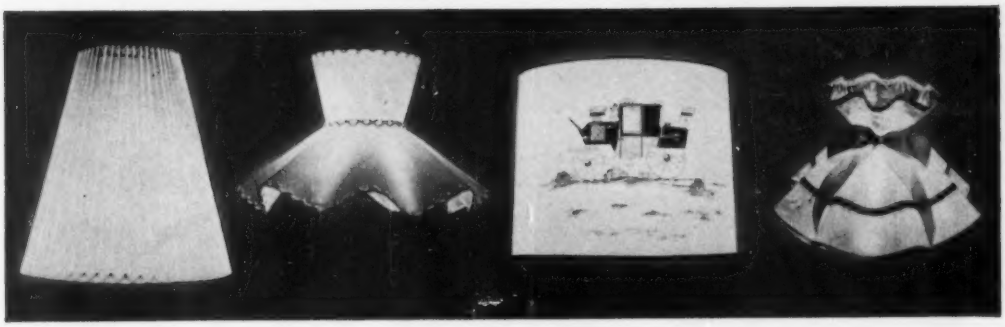
Write today for additional details. Include samples or drawings for estimates on electroformed masks that will insure precision spraying.

Typical products decorated with Fiore electroformed masks and spraying equipment.

WM. M. FIORE INC.

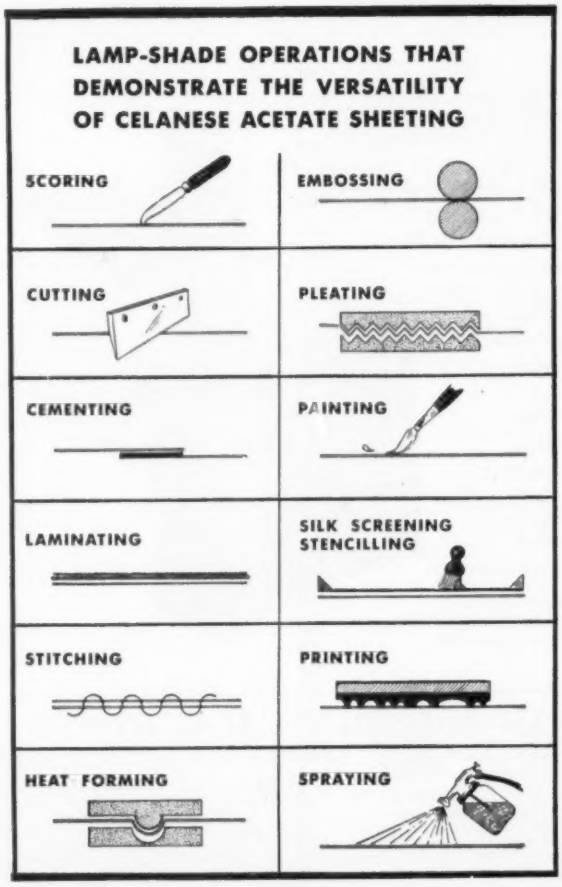
135 Liberty Street New York 6, New York

BArclay 7-2569



Here's Why Celanese® Acetate Sheeting Has Made Lamp-shade History . . .

LAMP-SHADE OPERATIONS THAT DEMONSTRATE THE VERSATILITY OF CELANESE ACETATE SHEETING



and why it is specified for hundreds of products today

Since 1930, leading lamp-shade manufacturers have created top quality, decorator lamp shades from Celanese acetate sheeting. Today, this familiar plastic is still found in one-of-a-kind designs – as well as in budget-priced, variety store lines.

The reason is simple: Celanese sheeting offers versatility, long service life . . . economy and ease of fabrication. Celanese acetate sheeting is available in a wide range of brilliant and pastel colors as well as clear transparent. These colors are specially formulated for lamp shades as well as other products.

If you are planning a product requiring plastic sheeting or similar material, check first with a Celanese representative. He will show how Celanese acetate can be an advantage in innumerable sheeting applications – from shoelace tips to jeep side-curtains. Celanese Corporation of America, Plastics Division, Dept. 101-J 180 Madison Avenue, New York 16, N. Y. In Canada, Canadian Chemical & Cellulose Company, Ltd., Montreal and Toronto.

*Reg. U. S. Pat. Off.

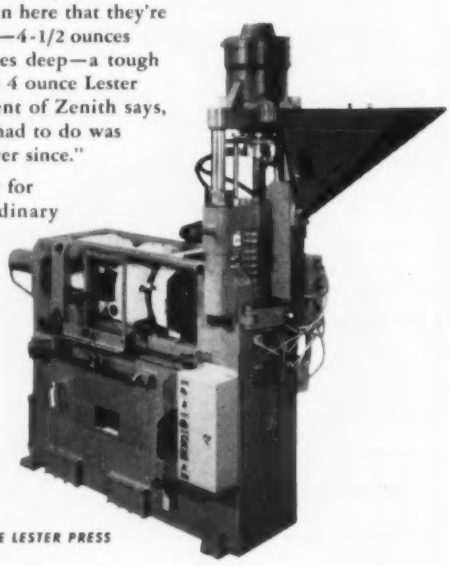
Celanese® Acetate SHEETING

4½ ounces from a 4 oz. LESTER

At ZENITH PLASTICS in Cleveland, they like the L-1/2-4 ounce Lester. It's small wonder when you examine the part shown here that they're running on the 4. It's a vacuum cleaner motor guard—4-1/2 ounces of acetate, 10-1/8 inches in diameter, about 2 inches deep—a tough job to fill without showing weld marks. But on the 4 ounce Lester they do it easily. As Paul Zurlinden, Vice-President of Zenith says, "We're delighted with the 4 ounce Lester. All we had to do was install it and it started running—and it has been ever since."

Here is the Lester machine that is offered especially for *fully automatic molding* of small shots at extraordinary production rates, or its full rated capacity at competitive cycles. The Zenith part clearly shows the extra capacity built into all the new Lester equipment. Besides, the cut-off attachment for molding nylon is standard on this machine.

Yes, day-in, day-out, trouble-free performance in one plant after another is the experience of satisfied Lester users. If you want to check complete specifications, write to Lester-Phoenix or the representative in your area listed below.



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distributed by LESTER-PHOENIX, INC., 2621-C CHURCH AVENUE • CLEVELAND 13, OHIO

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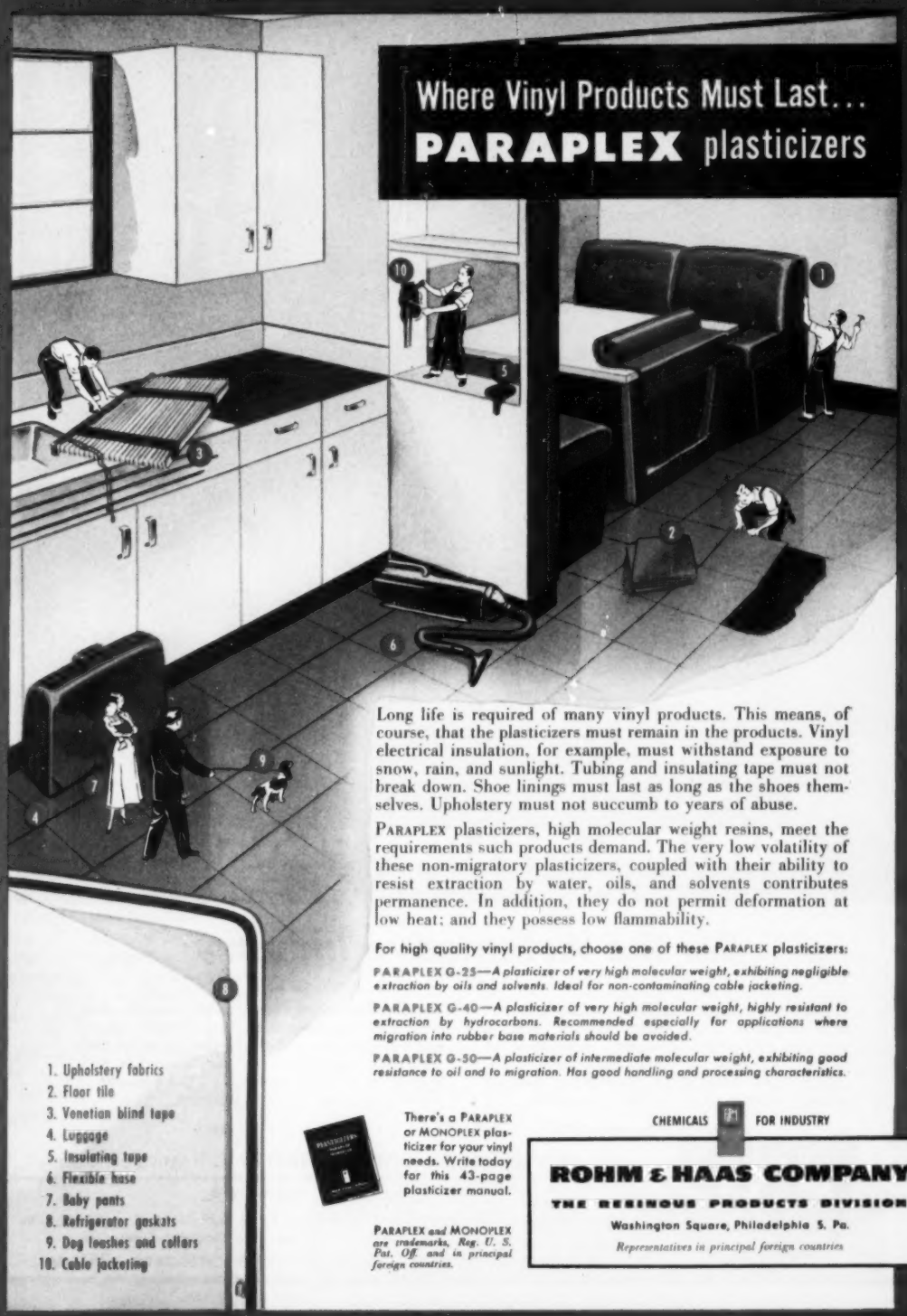
Where Vinyl Products Must Last...
PARAPLEX plasticizers



1. Upholstery fabrics
2. Floor tile
3. Venetian blind tape
4. Luggage
5. Insulating tape
6. Flexible base
7. Baby pants
8. Refrigerator gaskets
9. Dog leashes and collars
10. Cable jacketing

Long life is required of many vinyl products. This means, of course, that the plasticizers must remain in the products. Vinyl electrical insulation, for example, must withstand exposure to snow, rain, and sunlight. Tubing and insulating tape must not break down. Shoe linings must last as long as the shoes themselves. Upholstery must not succumb to years of abuse.

PARAPLEX plasticizers, high molecular weight resins, meet the requirements such products demand. The very low volatility of these non-migratory plasticizers, coupled with their ability to resist extraction by water, oils, and solvents contributes permanence. In addition, they do not permit deformation at low heat; and they possess low flammability.

For high quality vinyl products, choose one of these PARAPLEX plasticizers:

PARAPLEX G-25—*A plasticizer of very high molecular weight, exhibiting negligible extraction by oils and solvents. Ideal for non-contaminating cable jacketing.*

PARAPLEX G-40—*A plasticizer of very high molecular weight, highly resistant to extraction by hydrocarbons. Recommended especially for applications where migration into rubber base materials should be avoided.*

PARAPLEX G-50—*A plasticizer of intermediate molecular weight, exhibiting good resistance to oil and to migration. Has good handling and processing characteristics.*

There's a PARAPLEX or MONOPLEX plasticizer for your vinyl needs. Write today for this 43-page plasticizer manual.

PARAPLEX and MONOPLEX *are trademarks, Reg. U. S. Pat. Off. and in principal foreign countries.*

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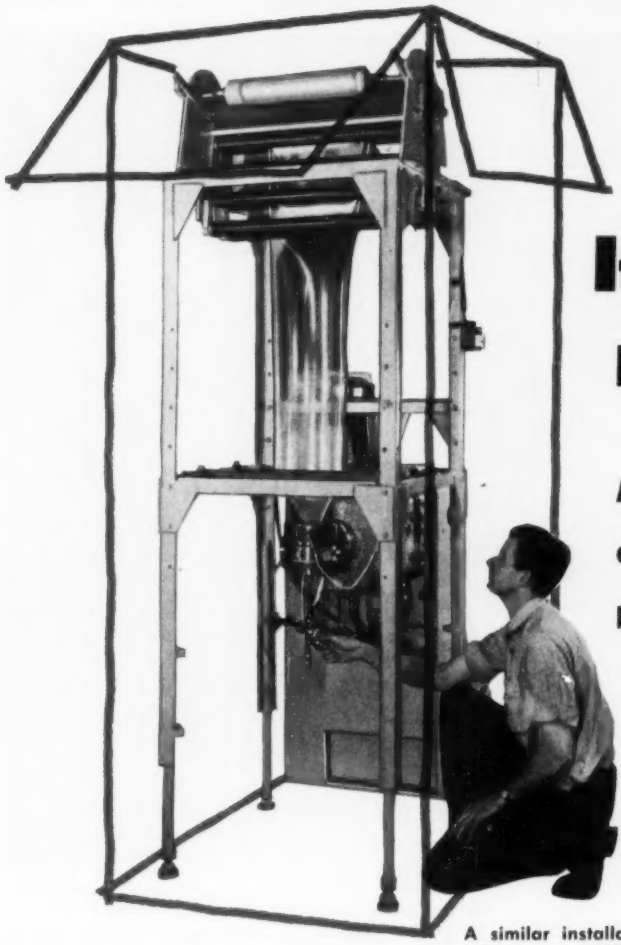

It's an MPM package

A complete set-up for extruding polyethylene or polyvinyl chloride layflat tubing from 2" to 16" wide

A similar installation of larger size, for tubing up to 48" wide, is also available

Consider the savings in time, the convenience and the economy of being able to purchase a complete "package" like this—1½" MPM extruder, new type tubular film die, and combination forming roll, pinch roll and take-up—for producing high quality, wrinkle-free polyethylene or polyvinyl chloride lay-flat tubing.

Once the component units are uncrated in your plant, they can be assembled in a very short time. The equipment is delivered ready for connection to your electric, water and air lines.

Before shipment MPM test-runs the complete assembly and its operation will be explained to members of your organization who attend these trials. This way MPM gives them all the "know how" they will need to start production.

Other MPM "complete packages" are available for manufacturing such products as polyethylene and saran monofilaments, 48" wide polyethylene or cellulose acetate sheet, fluted rods for screw driver handles, covered wire and flat polyethylene sheet to 72" wide.

MPM extruders and auxiliary equipment are recognized all over the world for their versatility and long, trouble-free service. Their superior design and construction, and unexcelled heat control system result in better extruded products being produced at rates which invite comparison. Details on MPM "complete packages" or individual extruders to meet your requirements will be sent on request.

California Representative:
WEST COAST PLASTICS DISTRIBUTORS, INC.
4113 W. Jefferson Blvd., Los Angeles 13, Cal.

modern plastic machinery corp.
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Cable Address: MODPLASEX

If it uses gas, it can use SYNTHANE

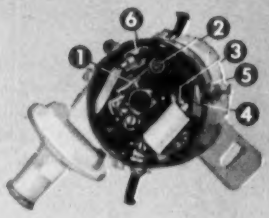
"I like to stand at the corner of Market and Main in my home town," one Synthane representative tells us, "and watch the traffic on a Saturday afternoon."

"There are our customers on parade . . . anything that uses gas—passenger cars, trucks, fire engines, motorcycles . . . Joe Zink's tractor . . . even the gas pumps at Eddie's service station use parts made from Synthane laminated plastics."

The reason is plain. When America turns on the ignition key it expects to go places. Back of this confidence are components.

Reliable components have to be made from dependable materials. Synthane is such a material. So you find it in water pumps because it makes a good seal washer, in differential thrust washers because of its wear resistance, in power steering for its light weight and rigidity, in starting and lighting equipment because it is an excellent electrical insulator and machines like a breeze.

Synthane might be a material you can use. The Synthane Catalog will help you decide. Send for your copy. Synthane Corporation, River Road, Oaks, Penna.



Autolite distributor uses laminated plastics in 6 places. (1) and (2) *insulating angle and bushing on breaker arm*, (3) *condenser seal washer*, (4), (5), (6) *insulating washers.*

Synthane-one of industry's unseen essentials

SYNTHANE
S
LAMINATED PLASTICS

Contracting for DOP?

Check these points regarding your DOP source of supply

Is your supplier a basic manufacturer? Monsanto is. In addition, recent Monsanto DOP plant expansion gives you even greater assurance of a ready and continuing source of supply.

Will your DOP contract be written for the length of time *you* desire? Your contract with Monsanto can be written to cover any length of time you wish.

Will you get technical service? Monsanto offers you technical service on plasticizer problems either at Monsanto's plasticizer research laboratories or right in your plant.

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Will the DOP you contract for be top quality? Monsanto DOP as well as all Monsanto plasticizers is made according to quality specifications rigidly maintained.

Get all these advantages. Make your next DOP contract with Monsanto. Let a Monsanto representative call and bring you complete details. Contact the nearest Monsanto sales office or MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second St., St. Louis 4, Missouri.

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MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY ... WHICH SERVES MANKIND

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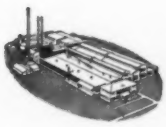
LET US FIGURE YOUR MOULDED THERMOSETTING JOB

Those are our two specialties. *Thermosetting mouldings* of all kinds—including Teflon and glass-filled polyesters. *Action—fast action*—on engineering, design, mould-making, moulding and finishing. Any or all of 'em!

Your plastics moulder can only offer you two things—equipment and the ability to use it. We've been building, adding to, and modernizing our store of both for over 35 years now. And we're ready for your job right now. Write or phone our main office or your closest branch office.



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FOR OVER 36 YEARS PLANNERS AND MOULDERS IN PLASTICS

Boost your molding production *with* PYR-O-VANE TEMPERATURE CONTROL

On this typical injection molding machine, two-position Pyr-O-Vane *instruments control the rear and flange heating zones. The critical front and nozzle zones are controlled by Pulse* Pyr-O-Vane *controllers, which supply heat input in pulses of controlled duration.*

YOU CAN collect valuable dividends in increased production—and decreased instrument maintenance—by applying *PYR-O-VANE* controllers to injection molding. For preheating stages, the "two-position" controller affords ample accuracy. The Pulse *PYR-O-VANE* provides time-proportioning control capable of maintaining the closest temperature tolerances in plasticizing zones.

The simplified, unit construction of *PYR-O-VANE* controllers features:

- *Interchangeability of control form . . . by simply plugging in the desired control unit.*
- *Compact case . . . standard size only 9⅞ x 8¾ inches for both instruments.*
- *Adjustable Proportional Band and Cycle Time . . . on Pulse PYR-O-VANE.*
- *High Stability . . . unaffected by ambient temperature, humidity or line voltage changes.*
- *High Resistance Circuit . . . allows use of long lead-wires.*

Our local engineering representative will welcome the opportunity to discuss applications with you. Call him today . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4437 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

First in Controls

● *Important Reference Data*

Write for Catalog No. 1053 on Pulse PYR-O-VANE Controller and two-position PYR-O-VANE Controller.

How many custom molders' reputations lie buried here?

FIT THE RIGHT TYPE FASTENER TO THE JOB, *NOT* THE JOB TO THE FASTENER

TYPE Z


HEX HEAD Z


TYPE F


TYPE F-Z


TYPE U

When excessive breakage occurs in assembling plastic parts, who gets the blame? It's the custom molder, in too many cases, while the real culprit is the *wrong type* fastener.

If molding is your business, you can protect your reputation by consulting Parker-Kalon about fasteners before your customers' assembly lines get into motion.

If you are a manufacturer, get fastening recommendations from P-K before parts spoilage sends your planned profit to the scrap can.

The P-K ASSEMBLY ENGINEER is a fastening expert who is ready to help you plan how to save operations, simplify assemblies, add product strength. And, he'll show you how to make those planned savings *pay off* on the assembly lines. He'll call at your request, or, send specifications of your product for recommendations. Parker-Kalon Corporation, 200 Varick St., New York 14.

DELIVERIES ARE BETTER . . . SPECIFY P-K

Since P-K, the originator of the Self-tapping Screw, makes a complete line, recommendations are unbiased. Find out why so many fastener-wise manufacturers say, "If it's P-K, it's O.K."

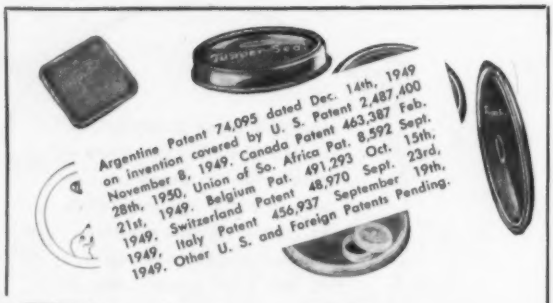
P-K TRADE MARK REG. U.S. PAT. OFF.

PARKER-KALON®

The Original **SELF-TAPPING SCREWS**

FOR EVERY METAL AND PLASTIC ASSEMBLY

Tupper Seal, air and liquid tight flexible covers fit, and are included in the sets of all Tupperware Canisters.



Argentine Patent 74,095 dated Dec. 14th, 1949 on invention covered by U. S. Patent 2,487,400 November 8, 1949. Canada Patent 463,387 Feb. 28th, 1950. Union of So. Africa Pat. 8,592 Sept. 21st, 1949. Belgium Pat. 491,293 Oct. 15th, 1949. Switzerland Patent 48,970 Sept. 23rd, 1949. Italy Patent 456,937 September 19th, 1949. Other U. S. and Foreign Patents Pending.

TUPPER / Seals

air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.

TUPPER!

The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.

The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.

FORMAL NOTICE! 9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

TUPPER CORPORATION

The Tupper Seal, air and liquid-tight, Pour All cover as a cover for 46 oz. cans; Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.

TUPPER

TUPPER CORPORATION

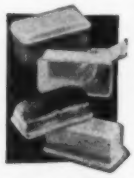
Manufacturers of — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

FACTORIES: Farnumsville, Mass., and Cuero, Texas **New York Show Rooms 225 Fifth Ave.**

ADDRESS ALL COMMUNICATIONS TO: Department M-10

There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 2, 5, 8 and 12½ oz. Tumblers too, and these Tupper Seal, covers fit many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Por Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.



The cover of the Tupperware Bread Server which serves as a bread tray also is designed to give similar results as Tupper Seal, air and liquid-tight Flexible covers. Keeps contents fresh as no other such container.

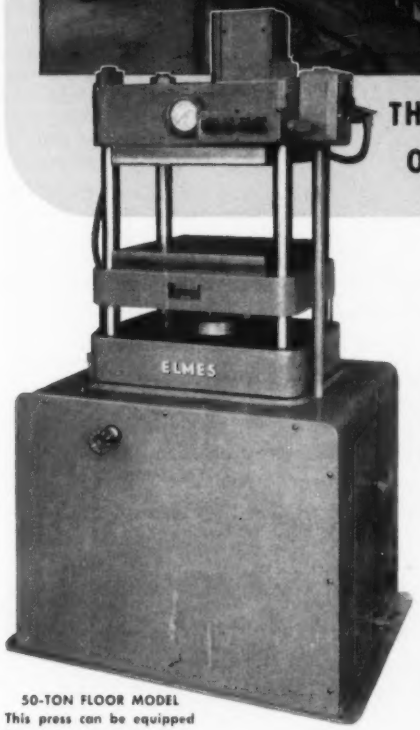
When equipped with Tupper Seal, air and liquid-tight, flexible covers, Tupperware Cereal Bowls serve many another purpose.

The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnels as a base when funnels are used as storage containers.

ELMES HYDROLAIRS®

Battery of 50-Ton Elmes Hydrolairs at Yonkers plant of Otis Elevator Company.

THE ANSWER TO LOW COST, HIGH QUALITY OUTPUT FOR *EVERY* PLASTICS MOLDER



50-TON FLOOR MODEL
This press can be equipped for semi-automatic pushbutton operation as illustrated.

Many a plastics molder can tell you that Elmes Hydrolairs are the most economical of all small hydraulic presses . . . in purchase price . . . operation . . . maintenance.

You start saving at first cost, as Hydrolairs have no pumps, no motors. They take their power *entirely from the shop air line.* Absence of motors and pumps means less weight, less maintenance. Yet with full hydraulic operation, Hydrolairs give a continuous high pressure stroke at predetermined ram pressure. The pressure you select is applied and automatically maintained for the desired time interval—even on compressible materials. Anyone can operate a Hydrolair!

Air requirements are negligible. There's no worry about foundation or floor loads. Hydrolairs are easy to install and move. For long runs or short, these simple, durable presses are ideal for every molding job within their size and capacity range. Made in 30 ton bench model and 30 and 50 ton floor models. Your Elmes Distributor can give you full details, or write for your free copy of Bulletin No. 1036-A. There is no obligation.

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ELMES ENGINEERING DIVISION

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in Spite of Vibration and Temperature Variations

IN assembling radio ignition shielding for aircraft engines, PLIOBOND—Goodyear's tan, thermoplastic, rubber-like adhesive – was used by this manufacturer. Despite temperature variations and vibration–in spite of moisture, abrasion, corrosion, oil, gasoline and cleaning solutions – the PLIOBOND union assures perfect bonds and complete protection.

PLIOBOND "bonds anything to anything"–and gives good aging qualities, high strength, ease of application and high chemical and moisture resistance to make it first choice in hundreds of assembly applications. Write for details:

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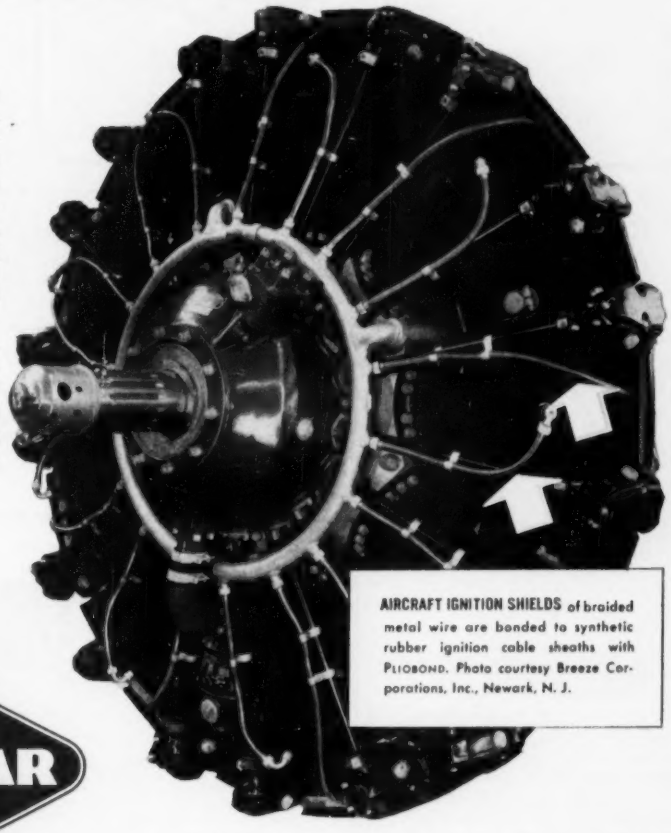

AIRCRAFT IGNITION SHIELDS of braided metal wire are bonded to synthetic rubber ignition cable sheaths with PLIOBOND. Photo courtesy Breeze Corporations, Inc., Newark, N. J.

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Mail this coupon today for your FREE copy of the PLIOBOND Booklet. Gives full details on permanent bonding with PLIOBOND.

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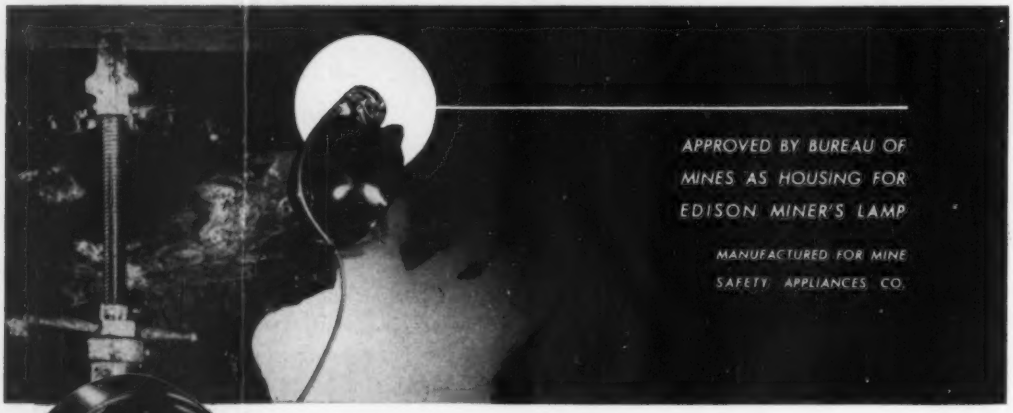

AN ESSENTIAL TOOL in underground operations, a miner's lamp must be rugged. It will be bumped, struck by dislodged pieces of coal and exposed to the action of corrosive mine water. The housing must stand up under these rugged conditions.

Rogers impact phenolic molding compound RX 428 is specified for this rugged assignment. It's tough, dimensionally stable and resistant to acids. In addition, it provides the efficient molding characteristics required of a plastics part that must be molded to tolerances of plus and minus .005".

For plastics parts with rugged assignments, investigate the wide range of Rogers preformable impact phenolics.

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CORPORATION
Established in 1832

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If you buy, specify or are in charge of the operation of rubber or plastics processing equipment, you should have copies of these fact-filled bulletins.

In the last few years, Farrel-Birmingham has pioneered many developments in processing methods and equipment, which have resulted in products of greatly improved quality and economies in production.

You will find details of these improvements in the above bulletins describing three of the most important units used in the production of rubber and plastics—Banbury mixers, mills and calenders. The fourth bulletin illustrated gives complete specifications of Farrel speed reducers, which are so widely used with these production machines.

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Shell Alvania EP Grease is the answer to some of the toughest lubricating problems in industry. In rolling operations, for example, operators of steel, rubber, plastic and paper mills report that this grease film *just won't be ruptured*, regardless of shock rolling load!

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You profit because mold steels are tool steels at Crucible. Our reputation as specialty steel leaders was built with tool steels.

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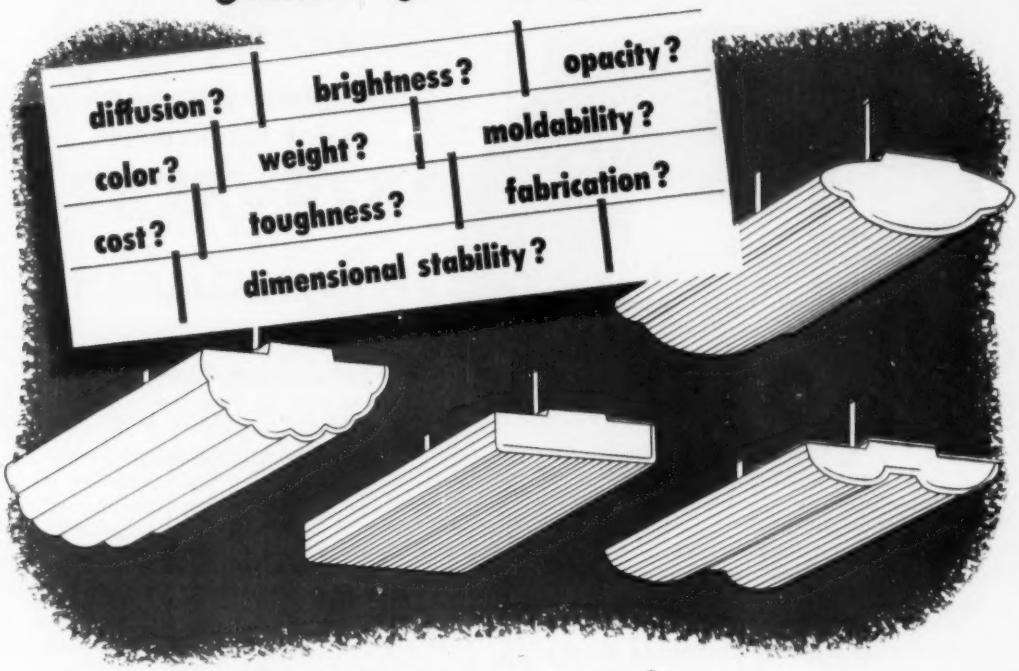

Koppers "EVENGLO" Polystyrene is your best solution!

KOPPERS "EVENGLO" POLYSTYRENE can solve your lighting fixture problem best because it gives you more optical and mechanical advantages than other materials commonly used for fluorescent fixture applications.

"Evenglo" is optically superior because you can exercise more accurate control over opacity, diffusion and color in the finished product. In effect, you can specify the color tone of light, degree of brightness and amount of diffusion desired, and you can be sure your specification will be maintained exactly in each "Evenglo" panel, from first to last.

Koppers Polystyrenes 8X and 81 are the types normally used in formulating "Evenglo." Its high heat distortion temperature gives it a decided advantage over competitive polystyrenes. "Evenglo's" unrivaled combination of easy moldability, dimensional stability, light weight, ease of fabrication and low cost makes it a desirable choice over other plastics and glass.

Koppers application engineers will be glad to demonstrate the versatility of "Evenglo" Polystyrene and to recommend the "Evenglo" formulation that fits your specific requirements.

Write for New, Free Bulletin C-2-162

It contains technical data about "Evenglo's" physical and optical properties, and outlines the scope of its usefulness in the lighting field.

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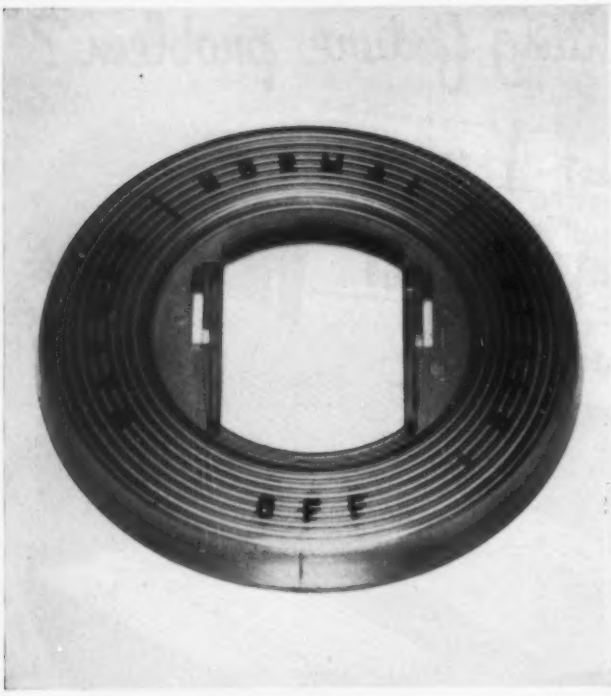

PLASTIC FOR INDUSTRY

Illustrated are two decorative plastic pieces currently being molded for the Midwest Manufacturing Company, Galesburg, Illinois, for the Admiral refrigerator. The parts are produced in polystyrene and decorated.

Our facilities are available for the production of large refrigeration components such as evaporator doors, breaker strips, door baskets, trims etc. We have capacity of up to 60 ounces and complete finishing facilities for all type of decorative work. Your inquiries are welcome and our engineers are at your service for consultation at all times.

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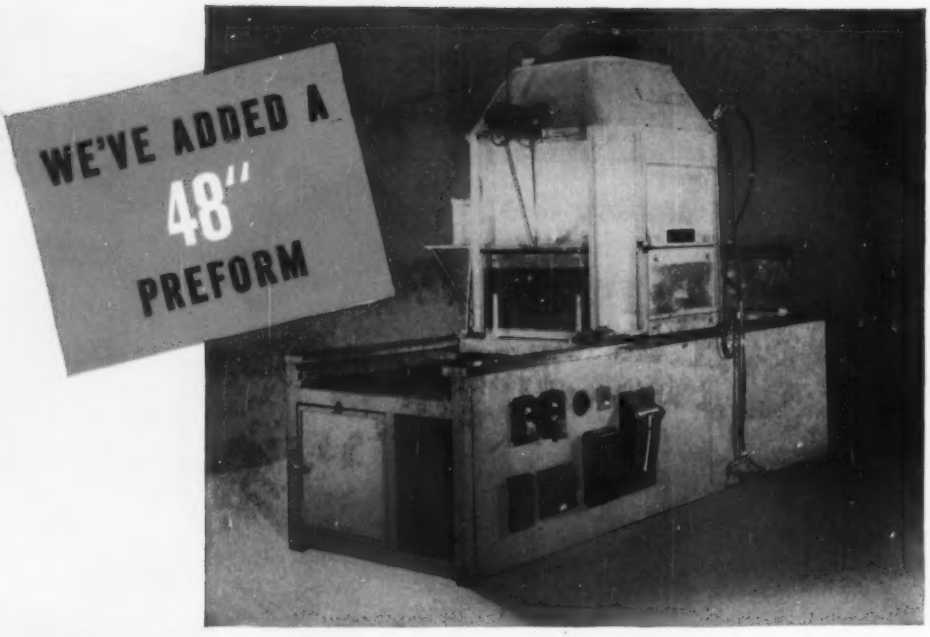

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Did you catch the one about the housewife who had her head cleavered off because she insisted on giving her butcher explicit directions for every saw stroke and knife cut? Well, *it could have happened,* except that it's a rare housewife who thinks she knows more than the butcher and tries to tell him how to butch. She tells him what she wants; the slicing's *his* business.

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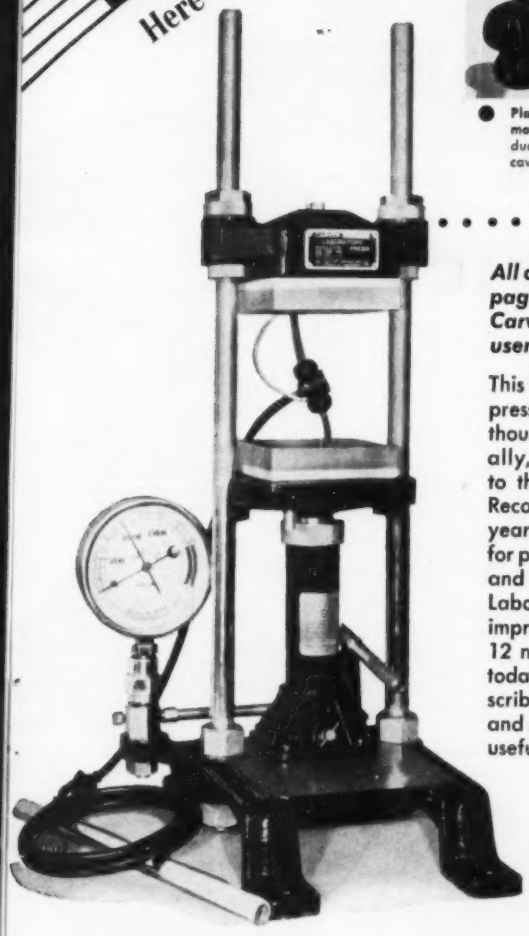
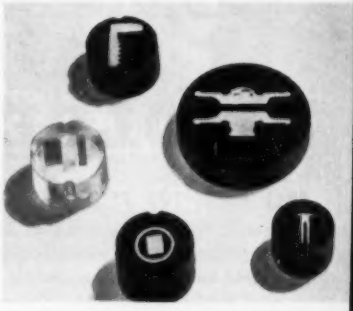
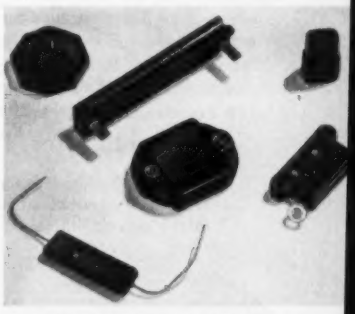


All of the items shown on this page were produced on the Carver Laboratory Press by users in the Plastics Industry.

This small, compact laboratory press is called "the press of a thousand and one uses." Actually, no one knows the limit to the number of its services. Recognized for more than 20 years as standard equipment for plastics laboratory research and development, the Carver Laboratory Press is now further improved by the addition of 12 new features. Mail coupon today for Carver Catalog describing these improvements and showing some of the many useful applications.



● **Mounting Metallographic Specimens**



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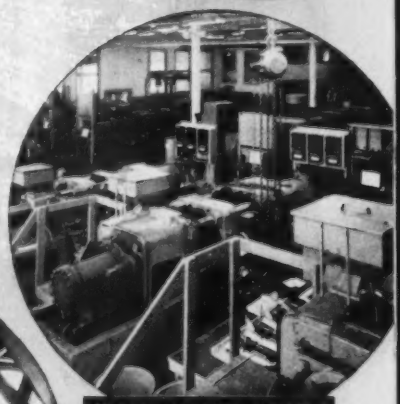
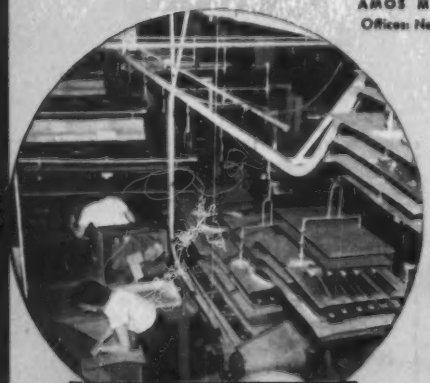
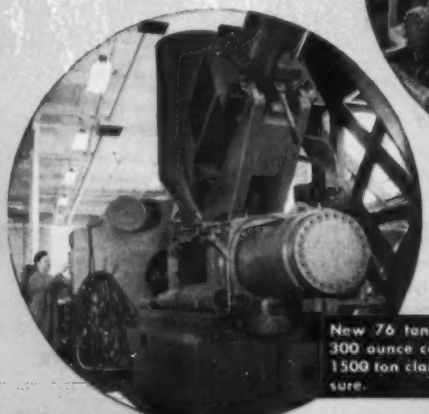


The newest and most modern injection molding machines.

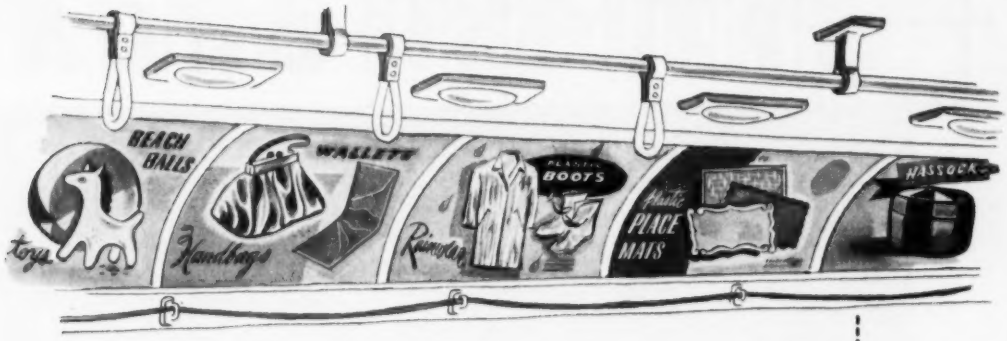


Over 1700 feet endless conveyors for multi-finishing and assembling operations.



New 76 ton giant . . . 300 ounce capacity . . . 1500 ton clamping pressure.

Are you missing the BUS when you seal plastics?



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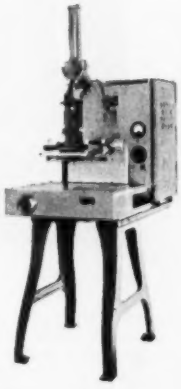
THERMATRON *welds*, doesn't *stitch* plastics. Produces permanent seams stronger than the material itself with never a weakening perforation! Permits development or design of many *new* products impossible any other way, and adds to your profits.

Standard THERMATRON models from ½ KW to 20 KW weld vinyl from .002″ up to .080″, serving most requirements — or we can build to your special needs.

Also available is the THERMATRON *Grommeter* for automatic grommeting or reinforcing operations . . . The THERMATRON *Welting Machine* for fast production of plastic binding and welting . . . and the THERMATRON *Automatic Quilter* for quilting of vinyl plastics.

Climb aboard the THERMATRON bus now! We'll gladly discuss your plastic sealing problems without obligation . . . And would you like a copy of our current bulletin? Ask for No. 69.



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FOR SUPERIOR FINISHED PRODUCTS

In the Plastics Industry, it is a known fact that Firestone EXON comprises one of the most versatile lines of vinyl resins available. America's leading plastics manufacturers are using EXON resins. They know that Firestone's never-ending research, technical service, and standardization policy assures them of raw materials of the highest quality—and therefore, a superior finished product. Check the properties of the EXON resins listed on this page. See how *you* can use them to advantage in *your* manufacturing processes.

THESE EXON RESINS CAN IMPROVE YOUR PRODUCT AND CUT PRODUCTION COSTS

EXON 402—A modified polyvinyl chloride resin of moderately high molecular weight. This resin has unusual versatility in that it may be used in both plasticized and unplasticized formulations.

EXON 500—A high molecular weight polyvinyl chloride resin. Excellent electrical properties, color, heat and light stability, physical toughness and chemical inertness. Specifically designed for wire covering purposes.

EXON 900—A high molecular weight general purpose polyvinyl chloride resin. Has excellent color, heat and light stability, toughness, chemical inertness and easy processing.

EXON 450—A vinyl chloride copolymer of intermediate molecular weight. Can be used as a soft compounding resin or alone in rigid sheeting. This resin possesses unique solution qualities suitable for many applications.

EXON 654—A polyvinyl chloride resin which can be readily dispersed in plasticizer to form a plastisol paste to which it imparts excellent heat and light stability, physical toughness and chemical inertness.

These new Exon Resins will soon be available

EXON 400 XR-61—A fluorinated thermoplastic resin which shows the characteristic excellent chemical and aging resistance of fluorine containing resins with the added advantage of being soluble in certain solvents for coating.

EXON 700 XR-59—A latex of high solids concentration containing a vinyl chloride polymer. The latex has excellent mechanical stability and is adapted to film forming and impregnating operations, producing films with good heat and light stability.

EXON 800 XR-60—A tough, rigid thermoplastic resin having high impact strength, excellent dimensional stability and electrical properties. Can be calendered, laminated, formed, injection and compression molded, or extruded in conventional plastics equipment.

For natural rubber compounds

For light or dark rubber—if you want soft, flexible natural compounds with maximum tear resistance—call for Multifex® MM. It gives you all these qualities at low cost; loadings can reach ratios of 100 parts Multifex MM to 100 parts natural rubber. Multifex MM disperses easily, too, especially when mixed as a concentrated master batch, then cut back to desired loading.

Write for our technical bulletin, "Precipitated Calcium Carbonates in Rubber and Polyvinyl Compounds".

DIAMOND SALES OFFICES: New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis, Houston.

DIAMOND DISTRIBUTORS: C. L. Duncan Co., San Francisco and Los Angeles; Van Waters and Rogers, Inc., Seattle and Portland, U. S. A.; Harrisons & Crosfield (Canada) Ltd.

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Ideal Plastics performs

Tests that guarantee your product's quality

Any manufacturer producing thousands of items daily must exercise constant vigilance to insure that all of them measure up to the highest standards. To be entirely effective, this watchfulness must cover product design, raw materials control and inspection and testing of finished merchandise.

No injection molder can boast a finer system for maintaining product quality than the one Ideal Plastics uses to safeguard the products we mold.

If Ideal builds the molds for your product (as we so often do), we will sometimes construct a same-size pre-mold model to give your engineers and ours an opportunity to study and modify the design before final approval. This step alone has been known to save large sums for Ideal customers.

Each batch of raw materials used to mold your product is thoroughly analyzed in Ideal's Chemical Laboratory. Flow characteristics, impact strength and color match are but a few of the factors which the laboratory scientifically checks.

While the products are being injection molded, sharp-eyed inspectors are always on the alert to prevent imperfect pieces from leaving Ideal's plant. In addition, Ideal's Physical Laboratory spot checks to see that the moldings match their specifications exactly.

As a result of this tireless system of checking and re-checking, the products which Ideal Plastics custom molds are invariably numbered among the finest procurable.

Ideal Plastics has earned a pre-eminent position in custom injection molding by being not only the biggest, but one of the best. Any injection molding job you contemplate should be quoted on by Ideal. Send full details about what you want molded to A. C. Manovill, Vice-President in Charge of Sales, Ideal Plastics Corporation, 184-10 Jamaica Avenue, Hollis 7, New York. Phone AXtel 7-7000. Mid-West Representative: Steel Mill Products Co., 176 West Adams Street, Chicago 3, Illinois. Phone: CEntral 6-5136.

Better Molded Plastics **Ideal** *for Industry & Home*

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if you don't register now

No doubt about it. This is going to be the most exciting—the most important—election in years and you won't want to be left out. But you won't be able to do a thing about it—*unless* you are registered.

That goes for all your relatives and friends and neighbors, too. So help them as you help yourself. Find out WHEN, WHERE, and HOW to register. Then pass the information along to all your friends. It's easy to get. Just call your local office in charge of elections, your City Hall or County Court House. Do it today! If you don't you'll kick yourself for passing up the chance to have your say on election day.

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should your plastic product have these qualities? _ _ _ _ _ _ _ _

- Flame resistance
- High resistance to water, oil, gasoline
- High permanence on heating
- Excellent electrical properties
- High tensile strength
- High flexibility, even at low temperature
- Low migration

or any combination of the above?

...then you can probably cut plasticizer costs with

MPS®-500

BULLETIN 35 gives you properties of MPS-500; comparisons with other plasticizers; detailed test data; typical formulations and uses. Write today, on your company letterhead, for a copy.

MPS-500 is a stabilized, chlorinated ester of a fatty acid. It shows excellent compatibility with vinyl chloride polymers and copolymers. Its low cost and valuable properties make it well worth investigating, for use alone or with other plasticizers.

• Hooker laboratories are fully equipped to test and evaluate plastic compositions. We are glad to help you solve problems where MPS-500 may be of interest. Your inquiry is invited.

From the Salt of the Earth

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when you use Waterproof Cloth Abrasive Belts by CARBORUNDUM

- Smooth-running splices — no "splice throb" to cause breakage
- Pre-stretched resin-filled cloth backing — high resistance to "wet-stretch" — less down-time for tension adjusting
- Clean, fast, cool cutting action — pre-buff finishes in record time
- Hard, sharp silicon carbide grain — high, continuous cutting rate
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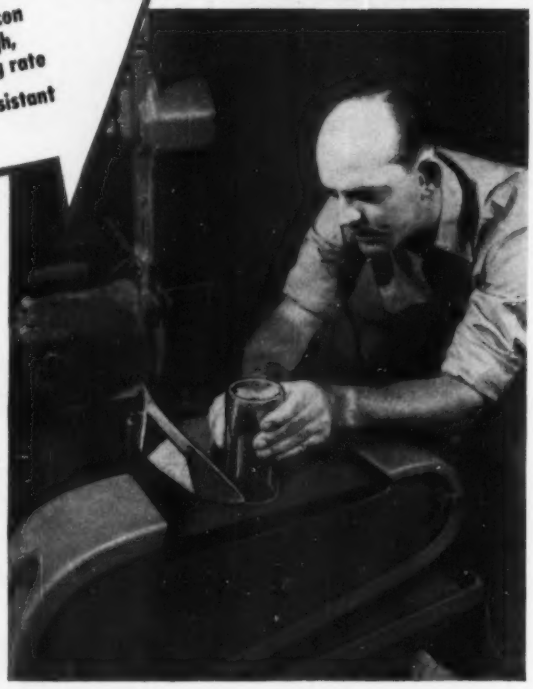


It's time you got acquainted with Waterproof Cloth Abrasive Belts by CARBORUNDUM. They're specially developed for wet sanding of plastics and other ductile materials subject to plastic flow.

These Belts by CARBORUNDUM hit the bulls-eye in delivering top-quality finishes at rock-bottom cost. Five big features deliver five big advantages to plastic molders by the hundreds, everywhere.

If you're not one of these users, we urge you to put this outstanding product by CARBORUNDUM to the test, on your own work. Call in the CARBORUNDUM man or distributor salesman—today.

OTHER COST-CUTTERS for plastic molders are available from CARBORUNDUM. For instance: Abrasive Cutting-Off Wheels. Superior for either dry or wet work... usually faster than steel saws... permit closer tolerances... give smoother cuts, thus often by-pass extra finishing operations... conserve the material being cut, since they cut with a thinner kerf. Ask the CARBORUNDUM representative for details, or write Dept. MP 82-52R.

Only CARBORUNDUM

TRADE MARK

offers ALL abrasive products ... to give you the proper ONE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, New York.

82-52

Cabinet molded for Zenith Radio Corp., Chicago

Skillful Molding Creates

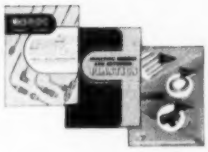
ITS NEWEST CABINET MEMBER

This cabinet which we molded for Zenith's new "Tip Top Holiday" portable is the latest in a long line of plastic cabinets molded by Mills. In shape—size—color—these cabinets have varied as widely as the products for which they were made.

All were alike however in one respect. Each was engineered and molded so that its attractive, sales appealing appearance was matched by sturdy durability.

The fact that we received additional cabinet molding jobs as well as other molding orders from the same clients proves we can be depended upon for top quality every time.

Let us show you today how our unique combination of sound engineering—*careful, correct* material selection and skillful molding can create a better plastic product for you.



Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about Colon Syndrome *, piping, tubing and fittings, write for circulars containing data and illustrations. *Trade Mark Registered.*

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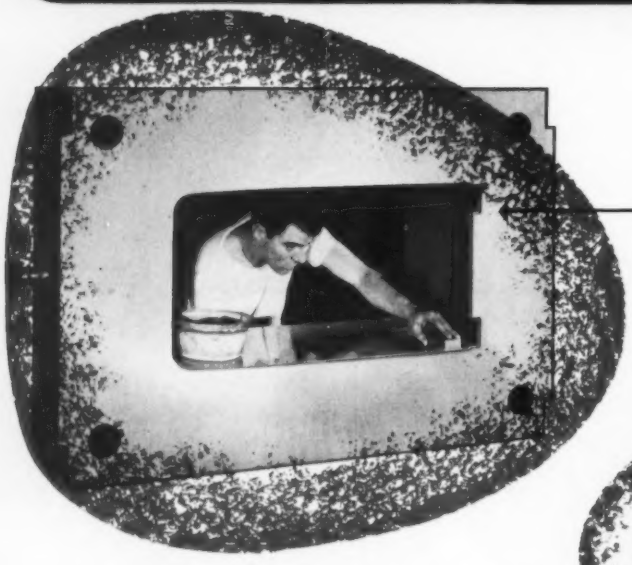
Unmatched Facilities
for building your molds

from the largest molds produced in this country

to the smallest and most intricate molds



One of the industry's best-equipped and most ably staffed toolrooms is yours to use, here at **MPc**. Here you will find advanced types of equipment operated by highly skilled, experienced craftsmen.

MPc will make all your molds, operating like your own mold-making department. Or you may wish to call on **MPc** for a single job that won't fit into your production schedule...or a mold that's too large for you to handle ...or one that poses difficult engineering problems. **MPc** *samples all molds, regardless of size, and submits piece parts for dimensional check before releasing molds.*

In pacing the advance to ever-larger plastic castings, **MPc** has acquired an unparalleled fund of experience in mold design, engineering and fabricating. Submit your mold-making problems to Molded Products Corporation, 4535 W. Harrison St., Chicago 24, Illinois.

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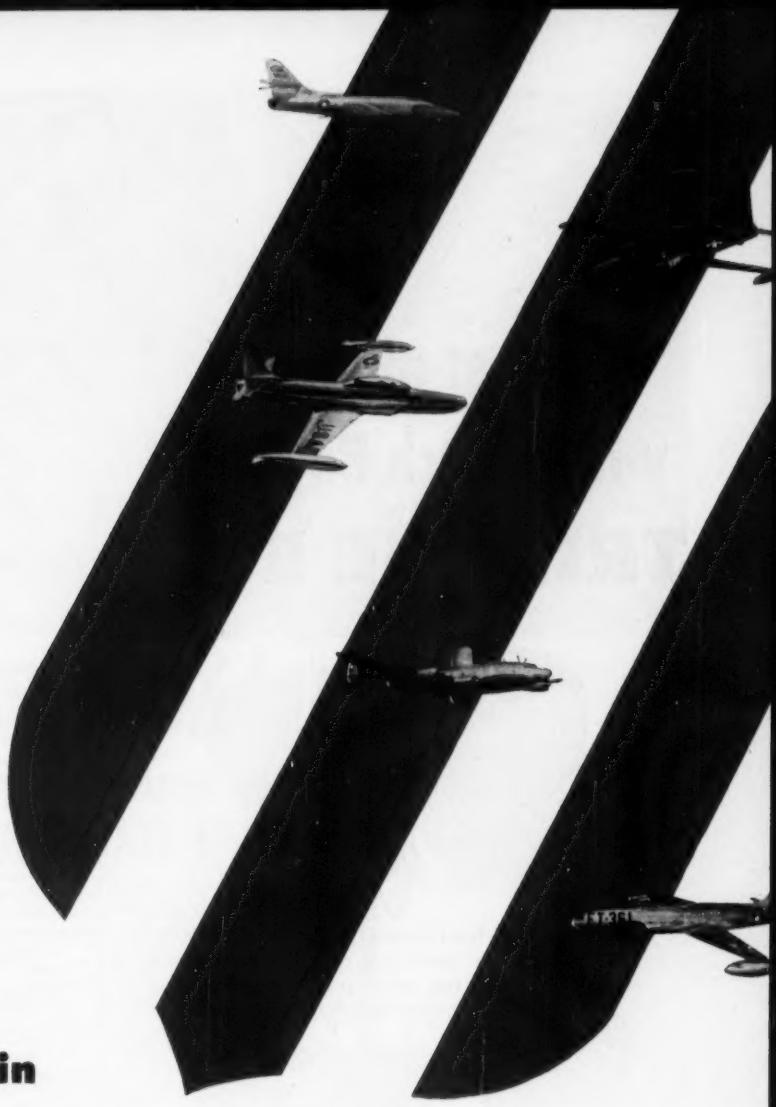

ZENITH parts in

Lockheed

"Battleships of the Air"

Zenith reinforced plastic parts have contributed to the strength, lightness, speed and maneuverability of the outstanding products of both Lockheed and others of America's leaders in the aircraft industry.

We are proud to have cooperated with Lockheed in the development and production of radomes and other vital reinforced plastic parts in the USAF, F-90, F-94, and T-33, and the Navy P2V and PO-W series.

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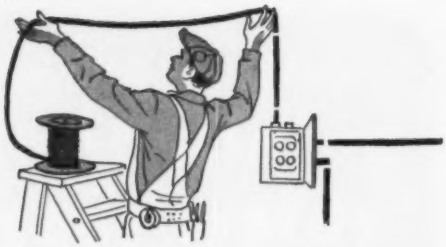

You get all 3 with "Dutch Boy" TRIBASE E (vinyl insulation stabilizer)

1. Good Electrical Properties. Tribase E provides all of the electrical advantages characteristic of lead silicates, without sacrificing great heat stability.

2. Exceptional Heat Stability. Tribase E's safe, high, available basic lead content guarantees good, long time heat stability. It also eliminates gassing and other types of stabilizer breakdown.

3. Low Volume Cost. Tribase E has a low specific gravity... making it the most economical "White Litharge" type compound available.

If you have a vinyl electrical insulation problem, consult our technical staff. And if you'd like more information and technical data about Tribase E, a request will be welcome.

"Dutch Boy" Stabilizers

PRODUCT	USE
TRIBASE (Tribasic Lead Sulphate)	Electrical and other compounds requiring high heat stability
TRIBASE E (Basic Lead Silicate Sulphate Complex)	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Stabilizer-lubricant for sheeting, film, extrusion and molded compounds
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored film, sheeting, batting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	Highly translucent film and sheeting
DYTHAL (Di-basic Lead Phthalate)	General purpose stabilizer for heat and light. Good electrical properties
DYPHOS (Di-basic Lead Phosphite)	Outstanding for heat and light in all opaque stocks, including plastisols and organosols. Exceptional weathering characteristics
NORMASAL (Normal Lead Salicylate)	As stabilizer or co-stabilizer in vinyl flooring and other compounds requiring good light stability
BARINAC (Barium Ricinoleate)	Stabilizer-lubricant for clears

Dutch Boy* CHEMICALS

*Reg. U. S. Pat. Off.

NATIONAL LEAD COMPANY

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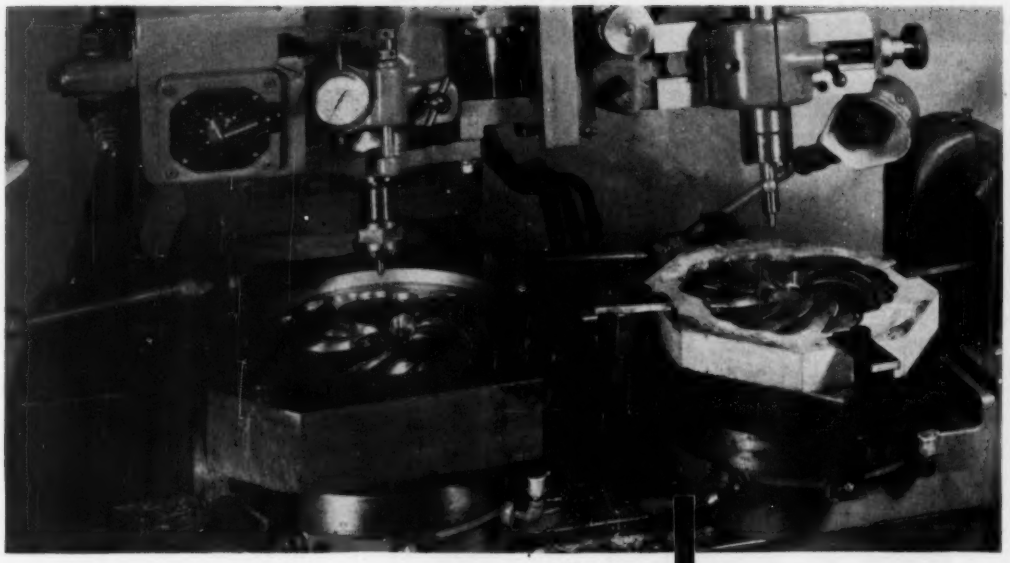


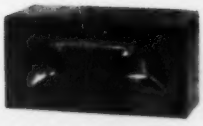
Low Cost Molds

FOR ATTRACTIVE PLASTIC PARTS MILLED ON CINCINNATI 8" x 18"

More and more molds for low-cost attractive plastic parts are being milled on CINCINNATI 8" x 18" Tool and Die Millers. There are good reasons for the swing toward these machines. Convex and concave sections are milled to a degree of accuracy and smoothness obtainable only with CINCINNATI's automatic hydraulic depth control unit. Reaction of the tracing finger is so sensitive that wood or plaster masters may be employed. Controls are conveniently grouped for operation while seated. Anti-friction feed screws and nuts take the work out of manual table and cross traversing. Other advantages of the CINCINNATI 8" x 18" will help you produce low-cost accurate molds for attractive plastic parts. Write for catalog No. M-1731.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI 8" x 18" Tool and Die Milling Machine. You may obtain complete data by writing for catalog No. M-1731.



Mold for telephone part, milled on CINCINNATI 8" x 18".

Mold for chess figure, milled on CINCINNATI 8" x 18".

Mold for jewel case, milled on CINCINNATI 8" x 18".

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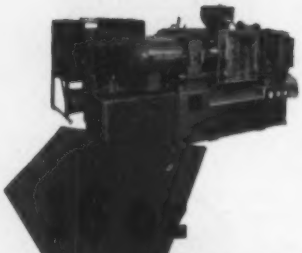
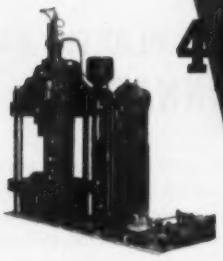
pre-plasticizing presses . . .

meet industry's critical plastics molding needs!

capable of pre- pounds of styrene per h dvantages of larger presses g Hendry Process, makes possible savings in operation and valuable floor space. Produces 130 square inches projected area** 11 second cycle . . . 180 tons locking pressure. One person can operate battery of five 6 oz. presses. Complete plug-in of all electric controls eliminates necessity of disconnecting wires, provides ease of maintenance.



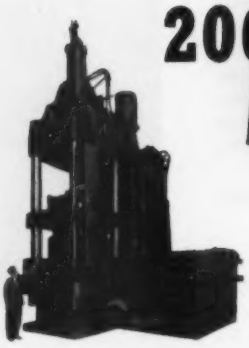


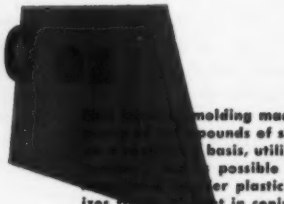
re inches of projected cycles.

Versatile, all-in-one press operates at lower injection pressures for substantial weight savings. Shots can be made in 30 second cycles from 48 ounces to 6 ounces. Has coloring advantages of larger presses.

The nsive research and exper the J-C horizontal press h famous J-C design features able pitch screw, multi-stage er screw, single zone injection ch ber holding 17 oz. of constant-tem perature viscous material, and hydraulically operated injection ram.

Plasticizes 180 pounds of styrene per hour with pressure exerted on the material in the injection chamber of 14,000 p.s.i. Locking pressure on the clamp is 225 tons.





molding machine with a ca- pounds of styrene per hour basis, utilizing the Hendry possible the molding of er plastic products. Utilizes fi t in conjunction with resistance hea upply constant viscosity material to the injection chamber. More projected area per ton clamping pressure . . . more strain-free moldings . . . less scrap. Injects uniformly plasticized material directly into mold without torpedoes, auxiliary plungers and other supplementary devices. Potential capacity: 300 oz. at 45 second cycle with substitution of 300 oz. chamber.

* Patents applied for

** Dependent upon part design, mold design & material

Hendry PRE-PLASTICIZING PROCESS J-C

A PRODUCT OF

JACKSON & CHURCH CO. • SAGINAW, MICHIGAN

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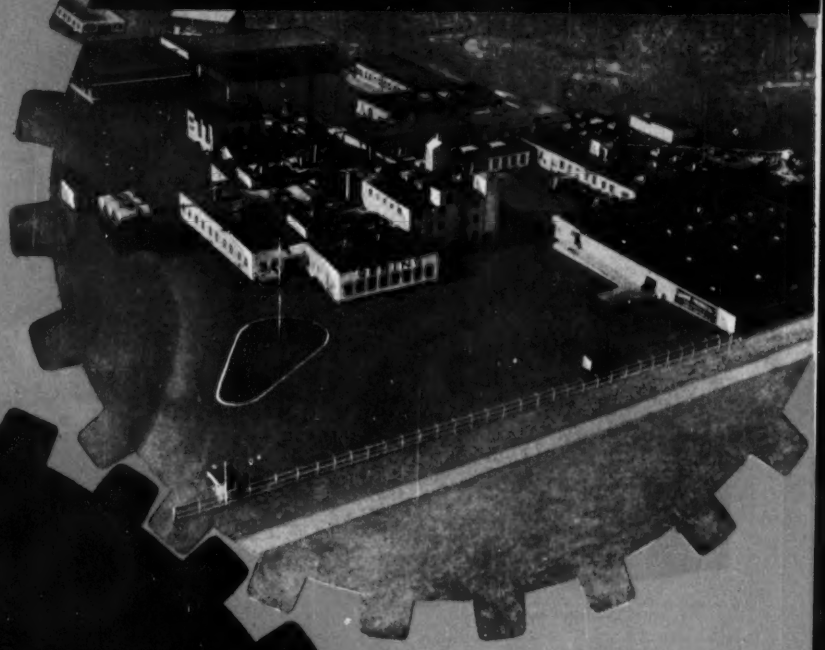
a complete **PLANT**

for a complete **SERVICE**



WE MANUFACTURE Virgin Thermoplastic injection and extrusion molding compounds, standard and special formulations . . . Polystyrene, Polyethylene, Acetate, Acrylics, Ethyl Cellulose, Vinyls.

- WE BUY THERMOPLASTIC SCRAP — all types and forms: Polystyrene, Vinyls, Nylon, Ethyl Cellulose, Polyethylene, Acetate, Butyrate, Acrylics.
- WE CUSTOM COMPOUND your materials, and offer these special services: Sorting, De-contaminating, Color-Matching, Pelletizing.
- WE EXTRUDE any flexible or rigid formulation which you plan, for any special-shaped Belting, Binding, Edging, Rods, Tubes, Film, Strips . . . in Polystyrene, Cellulose Acetate, Polyethylene, Vinyl, Butyrate, Ethyl Cellulose, Acrylics.

DRYCOL —offered as Gering's perfected dry coloring medium for in-plant coloring of ALL PLASTICS. No special skill or equipment needed. Standard, Special and Metallic colors available or to order.

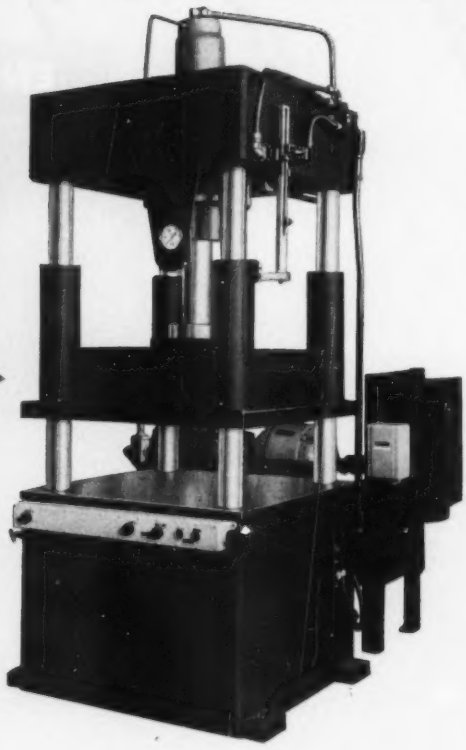
Our service is world-wide . . . attained over the years thru eternal self-discipline for Quality, Perfection, Delivery. Consult our Technical Service Department.

Our 30 years expert know-how and large facilities: Your guarantee of complete satisfaction.

GERING *Products* INC. KENILWORTH, N. J.

DAKE GUIDED PLATEN PRESS

for molding reinforced plastics



Here is a press engineered to the requirements for compression molding of reinforced plastics. It is a 75-ton 4-post double-acting platen press, electrically powered and hydraulically operated.

The press is equipped with a special timing device arranged so that the ram advances quickly almost to contact—then advances under full power until exactly the desired pressure is exerted on the mold. This pressure is maintained steadily throughout the curing cycle (time interval may be adjusted), after which it is released automatically and the ram returns to starting position.

Dake Guided Platen Presses, like other Dake Presses, can be engineered to your particular requirements. They are available in capacities up to 300 tons. We will gladly work with you in developing the molding press you need. A letter or phone call will put us to work.

Dake Engine Company, 648 Seventh St., Grand Haven, Mich.

DAKE PRESSES

Arbor Presses | Hand-Operated Hydraulic | Power-Operated Hydraulic | Guided Platen | Gap Type Presses | Movable Frame

IDEAS *in the making*

Araldite Bonding and Casting Resins developed by Ciba Research are simplifying manufacturing methods, improving product efficiency, and opening new fields of product development. You will want to know more about them.*

ARALDITE® BONDING RESINS

ARALDITE® TYPE	CURING CONDITIONS	PHYSICAL APPEARANCE	BOND STRENGTH* ALUMINUM-ALUMINUM (LB./SQ. IN.)	SUGGESTED USE
AN-101	Room temperature	High viscosity liquid	2000-2500	Bonds or seals glass-metal.
AN-102	Room temperature	Low viscosity liquid contains solvents	1400-1600	Bonds metal-metal and metal-wood.
AN-111	Heat cure	Low viscosity liquid contains solvents	2000-2500	Impregnating (vacuum method), laminating and bonding.
AN-115	Heat cure	Low viscosity liquid contains solvents	2500-3000	Impregnating, laminating and bonding.
AN-106	Heat cure	Heavy paste silver color	3000-3200	Bonds socket-type joint.
AN-107	Heat cure	Heavy paste tan color	3000-3200	Bonds socket-type joint.
AN-112	Heat cure	Heavy paste tan color	2500-3000	Laminating, bonding. Rapid cure.
AN-100	Heat cure	Powder tan color	4000-4500	Bonds Heat-resistant, smooth, non-porous materials . . . metal-metal, metal-glass, metal-ceramic, glass-glass
AN-110	Heat cure	Powder silver color	4000-4500	
AN-120	Heat cure	Stick tan color	4000-4500	
AN-130	Heat cure	Stick silver color	4000-4500	
AN-104	Room temperature	Non-flowing paste tan color	1000-1500	Bonds loose-fitting joints.
AN-103	Heat cure	Non-flowing paste tan color	1200-1400	Bonds loose-fitting joints.

*ASTM D1002-49T

ARALDITE® CASTING RESINS

ARALDITE® TYPE	CURE	PHYSICAL APPEARANCE	SUGGESTED USE	SHRINKAGE	ELECTRICAL PROPERTIES
CN-501	Heat cure	Amber solid	Casting, potting, encapsulating. Good adhesion.	Very low (½ to 2%)	Excellent
CN-502	Room temperature or heat cure	Thin liquid	Casting, potting, encapsulating. Good adhesion.	Very low (½ to 2%)	Good
CN-503	Room temperature or heat cure	Liquid	Similar to Araldite CN-501. Low temperature. Pour.	Very low (½ to 2%)	Excellent
CN-504	Heat cure	Very thin liquid	Impregnating, casting, potting, encapsulating. Good adhesion.	Low (< 2%)	Good

SEND THIS COUPON . . . or write us on your company letterhead . . . for complete technical data on the physical properties and recommended procedures for the successful use of Araldite Resins for your own fabricating needs.

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Ciba *Plastics*

★ BONDING ★ CASTING ★ COATING RESINS

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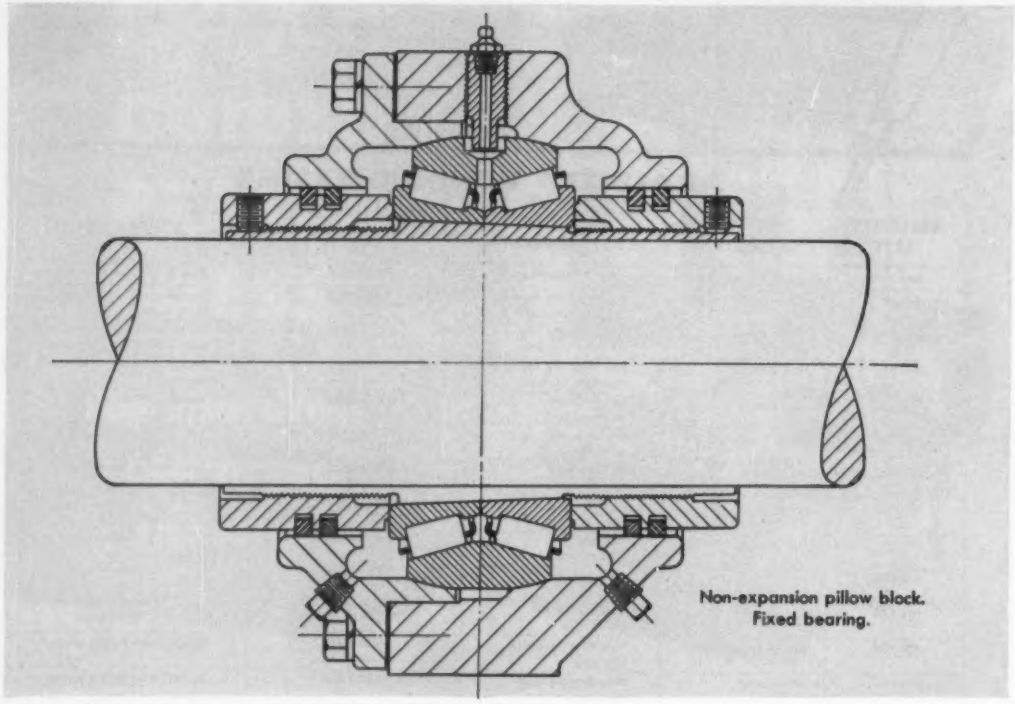
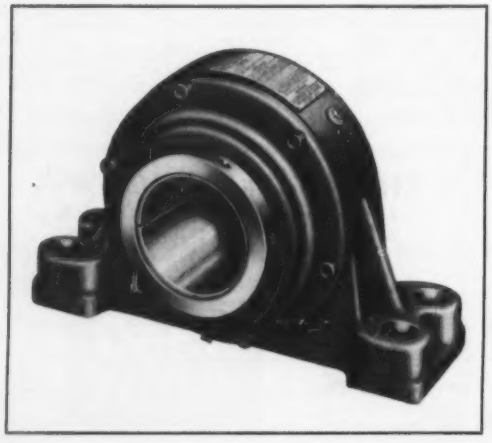


Non-expansion pillow block.
Fixed bearing.

First application of new tapered makes new Dodge-Timken®

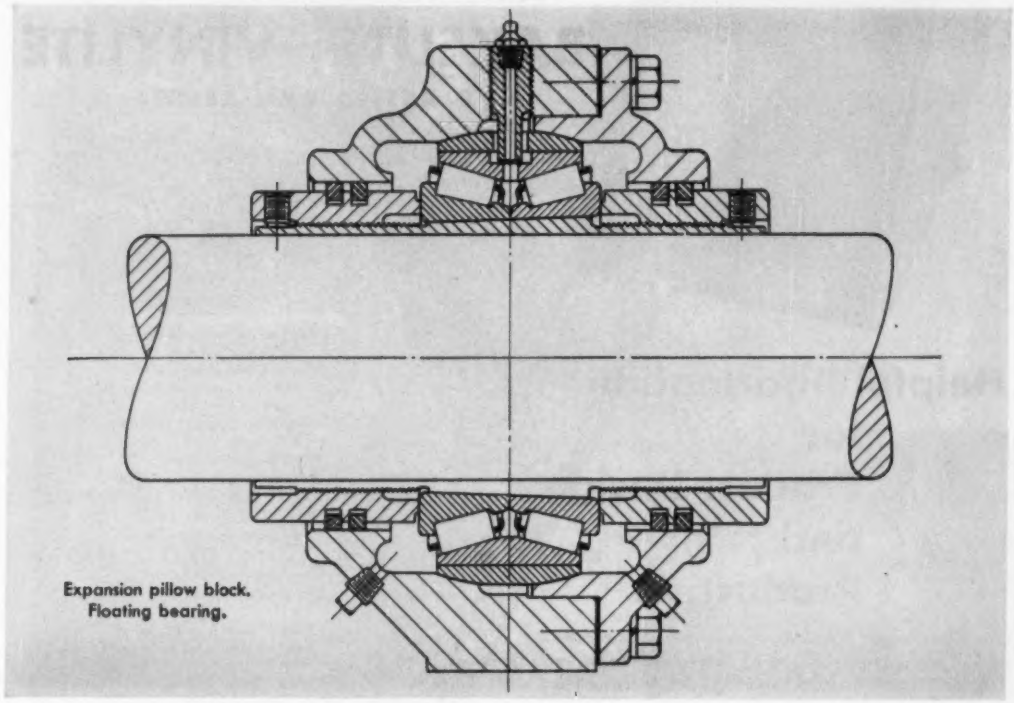


IT takes up less space. It weighs less. Yet the new Dodge-Timken® All-Steel pillow block has tremendous load-carrying capacity.

It's the result of the combined achievements of the Dodge Manufacturing Corporation, Mishawaka, Ind., and The Timken Roller Bearing Company and makes use of an entirely new Timken bearing. Never before has a self-aligning, non-adjustable tapered roller bearing with tapered bore been used in pillow blocks.

Being of all-steel construction, this new Dodge-Timken pillow block is more compact and fills a real need where space is a factor. It is available in both expansion and non-expansion designs. And it incorporates all the advantages of Timken tapered roller bearings.

BEARING PILLOW BLOCK



Expansion pillow block.
Floating bearing.

bore TIMKEN® bearing pillow block more compact

Because of their tapered construction, Timken bearings take radial and thrust loads in any combination. Line contact between rollers and races gives Timken bearings load-carrying capacity to spare. Timken bearings are made of the finest steel ever developed for tapered roller bearings—Timken fine alloy steel—and under normal conditions will last the life of the machinery with which the pillow blocks are used.

When you install new Dodge-Timken pillow blocks, you can expect dependable performance because the bearings are the best. No other bearing can give you all the advantages you get with Timken bearings. Specify them for all your other machinery, too. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◎ AND THRUST ◎ LOADS OR ANY COMBINATION ✳

NEW

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- Vinyl Rigid Plastics
- Styrene Plastics
- Polyethylene Plastics
- Vinyl Elastomeric Compounds

PROTECTIVE COATING RESINS
- Vinyl Resins for Metal and Concrete Coatings
- Phenolic, Polystyrene, and Styrene Copolymer Resins for Coatings
- Vinyl Resin Coatings for Paper, Foil, Cloth
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- Phenolic Foamable Resin

Helpful Information for Product Design and Production

This compact illustrated booklet contains a wealth of practical data on types of plastics and resins in greatest demand and use today. It discusses special characteristics such as shock-resistance, low electrical loss, heat-resistance, machinability, resistance to chemicals. It details their properties, such as water resistance, molding shrinkage, impact strength, flexibility, specific gravity. It tells in what form—powders, solutions, granules, film, sheet and sheeting—different plastics and resins are used and what colors and finishes may be obtained. It features the processing methods—molding, extrusion, calendering, coating, laminating and bonding—by which these materials are converted to a variety of end uses.

The booklet provides a clearer understanding of plastics, resins, and their uses for the non-technical reader—and serves as an invaluable ready-reference for the plastics user. It is a logical first-step in the selection of the right plastic for the job.

Dept. EM-13 BAKELITE COMPANY
A Division of Union Carbide and Carbon Corporation UCC
30 East 42nd Street, New York 17, New York

Please forward without cost or obligation G-19, "1953 Condensed Reference File of BAKELITE and VINYLITE Plastics and Resins."

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AND Vinylite BRAND
PLASTICS

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A Division of
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You can make money with scrap plastics and snips of aluminum wire

ALL over the nation along residential sidewalks, you can watch small fry happily brandishing toy guns that look like the real thing.

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Possibly there is a place in your business where a practical, production-scale high vacuum metallizing process can save you money and markets. If so, the chances are DPi equipment can do for you what it has already done for toys.

We shall be glad to look into the details with you. Write for information to ***Distillation Products Industries,*** Vacuum Equipment Department, 779 Ridge Road West, Rochester 3, N. Y. (Division of Eastman Kodak Company).

Metallized plastic pistols emerging from a DPi high vacuum coater.

Transferring pistols from the high vacuum holding fixture to a dipping tank for lacquer overcoating.

DPi

high vacuum research and engineering

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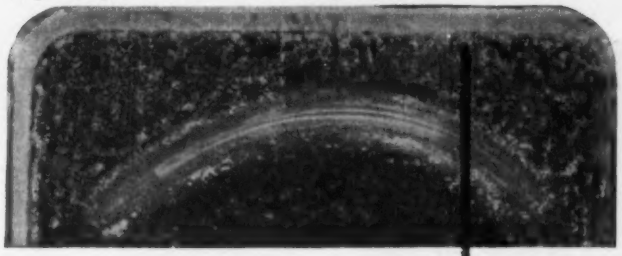
Vinyl tubing without Milmer 1 is damaged by mildew.



Vinyls, with MILMER 1, resist mildew

Vinyl tubing with Milmer 1 resists fungi attack.

Vinyl tubing, vinyl insulation, vinyl fabric coatings and vinyl film, containing Monsanto Milmer 1, resist attack by fungi . . . look better . . . last longer than unprotected vinyls.

Fungi attacking vinyls sometimes can be seen, as in mildew, but are often invisible—causing serious damage as they eat away the plasticizers. Fungi cause vinyl products to lose their flexibility. The resultant cracking soon renders the product useless.

By following methods developed by Monsanto Research, it is easy to incorporate Milmer 1 in vinyl coating formulations, whether calendered, plastisol, organosol or solvent. Properly applied, Milmer 1 (copper 8-quinolinolate) will not cause crocking, bleeding or blooming. It does not cause trouble on calender rolls. It is *nontoxic* and *permanent*.

If you want complete information on the application of Milmer 1 to protect vinyls against fungi, contact the nearest Monsanto Sales Office or write MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

Milmer: Reg. U. S. Pat. Off.

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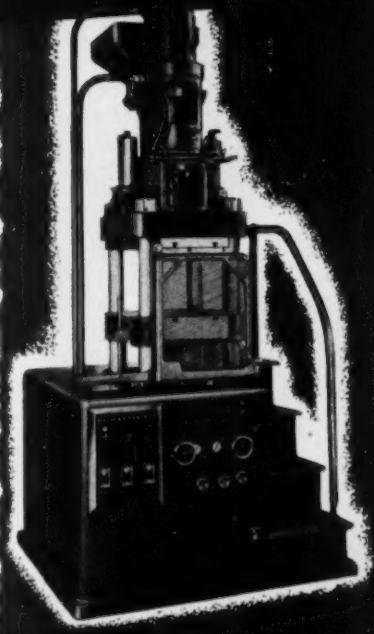
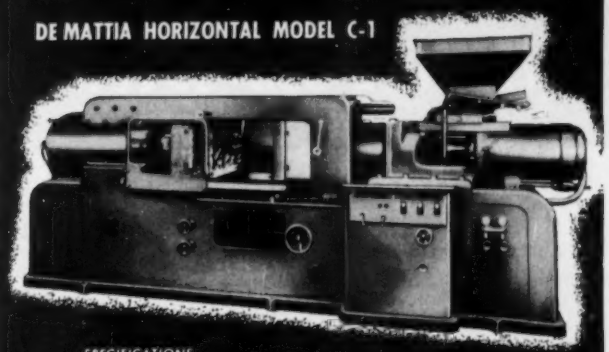


DE MATTIA
VERTICAL MODEL G-1

SPECIFICATIONS

Ounces Molded per Shot – 4 (Styrene); Pounds of Plasticized Material per Hr. – 50; Capacity of Feed Hopper (Lbs.) – 50; Diameter of Injection Plunger – 1⅞"; Diameter of Hydraulic Injection Cylinder–8½"; Pressure on Material – 20,500 lbs. per sq. in.; Size of Die Plates – 14" x 23"; Mold Opens – Stroke – 15"; Max. Daylight – 19"; Min. Die Space–4"; Motor – 20 HP @ 1,200 RPM; Pump Capacity – 54 GPM @ 1,000 PSI; Mold Closing Pressure (Tons) – 150; Floor Space Required – 47" x 59" – Height Over All – 108"; Approximate Wt. of Machine (Tons) – 4½; Injection Piston Stroke – 7¼" Closing Cylinder Bore– 8 1/16"; Complete Injection Time (Max.) – 1.88 Sec.; Heating Cylinder – 4,350 Watts.

DE MATTIA HORIZONTAL MODEL C-1



SPECIFICATIONS

Material per Injection – 12 ozs.; Plasticized Material per hour – 130 lbs.; Feed hopper Capacity – 60 lbs.; Injection Piston Diameter – 2¾"; Injection Piston Stroke – 11⅛"; Hydraulic Injection Cylinder Bore – 13"; Pressure on Material – 22,500 PSI; Mold Closing Pressure – 400 Tons; Max. Mold Size – 18" x 25"; Max. Daylight–30"; Min. Die Space–6"; Max. Stroke–24"; Oil Pump Capacity – 60 GPM @ 1000 PSI; Max. Motor – 30 HP; Injection Stroke Time, for Filling Mold – 3.0 Secs.; Speed of Injection Piston, Forward – 120" per Min.; Heating Cylinder–13,000 Watts; Height of Machine, Overall–72"; Floor Space Required – 172" x 42"; Approx. Weight – 10 Tons.

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STERLING SLO-SPEED!

Replacement of line shafting and one motor with individual, compact, self-contained Sterling Slo-Speed Geared Electric Power Drives on three tumbling barrels increased production 25%, reduced power costs about 25%, decreased maintenance costs 20% and improved employee morale through greater plant safety, reports Allen C. Pearson, General Manager of Ace Plastic Co., Jamaica, N. Y.

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Banbury Mixer at I.C.I. Vinyl Plant, Hillhouse, Lancashire.

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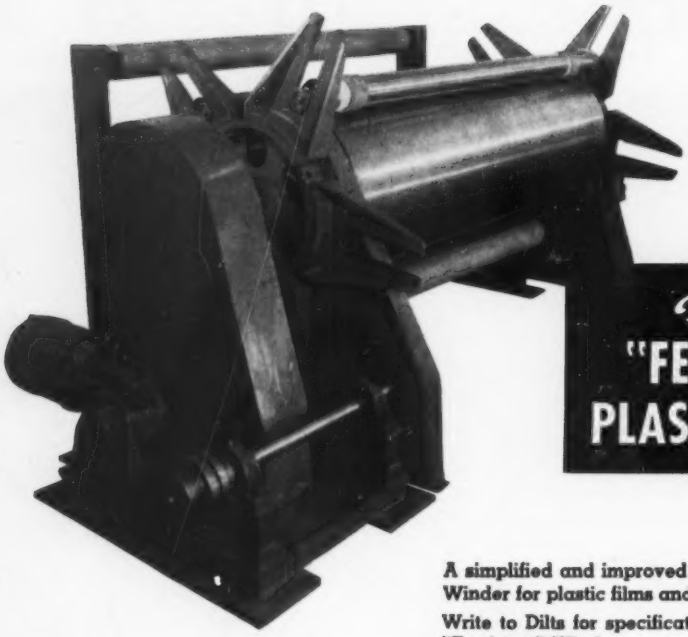
Keeping pace with the world demand for plastics, I.C.I.'s modern plants produce a wider range of plastic material than that of any other manufacturer.

This includes the acrylics, 'Perspex' sheet, and 'Diakon' moulding powder; 'Corvic' and 'Welvic' polyvinyl chloride and its compounds; the 'Mouldrite' range of thermosetting moulding powders and resins; and 'Alkathene' brand of polyethylene. I.C.I. were the first to polymerise ethylene and have been manufacturing polyethylene commercially since 1939.

IMPERIAL CHEMICAL INDUSTRIES LTD.
Plastics Division,
Black Fan Road, Welwyn Garden City, Herts., England

P.5310



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A simplified and improved Continuous Surface Winder for plastic films and sheeting.

Write to Dilts for specifications on Model 5 FP "Ferristart" Winder.

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DOWTHERM speeds the heating cycle while at the same time reducing labor costs. In addition to being used in forming operations, DOWTHERM's ease of control and application also assists in the mass production of nylon, and phenolic and alkyd resins.

Are you fully acquainted with DOWTHERM's higher operating efficiency? If *your* process requires temperatures between 300 and 750°F., we welcome the opportunity to discuss DOWTHERM with you. Write to Dept. DO 22 and ask for "The Dowtherm Story."

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did you miss any of these important articles?

Shown below are pages torn from four successive issues of Modern Plastics. These significant articles appeared in the magazine together with scores of additional feature stories, spot news items, technical and engineering articles, production reports and other items of basic interest to those who are associated with the plastics industry. They are typical of the timely editorial material which makes Modern Plastics "must reading" every month for those who want to keep on top of the dynamic, fast-evolving plastics picture.

The editors of Modern Plastics have many absorbing articles planned for the months ahead. Surely, many will be of vital concern to you and your business.

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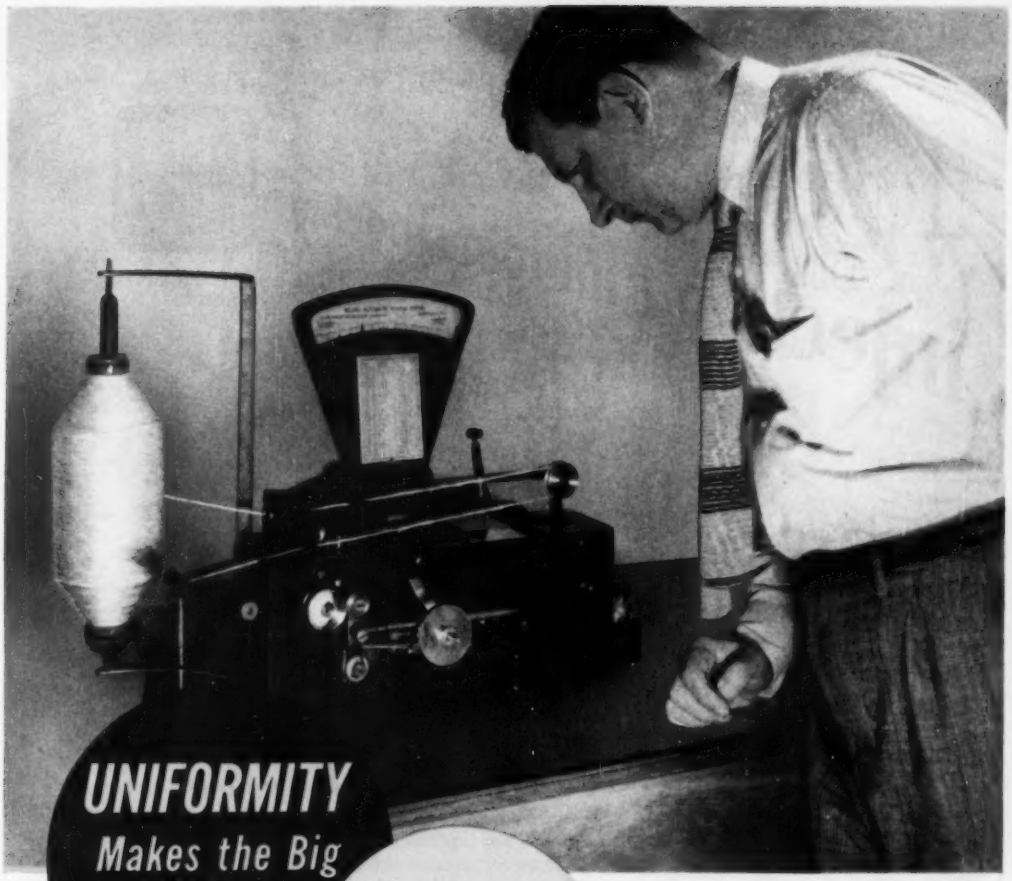

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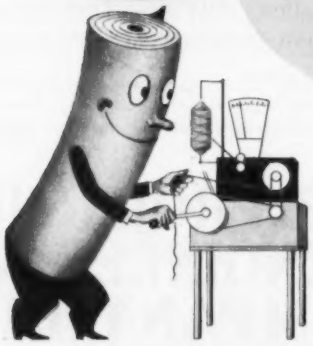
Makes the Big Difference
In LAMINATION Fabrics



MT. VERNON EXTRA Gives You Greater Fabric Uniformity

Shown is one of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products. Here coefficient of variation and average factors of quality on evenness in roving is being checked with Belger Tester.

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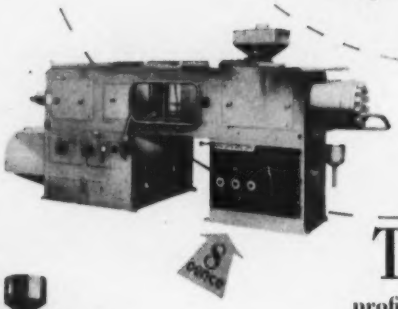
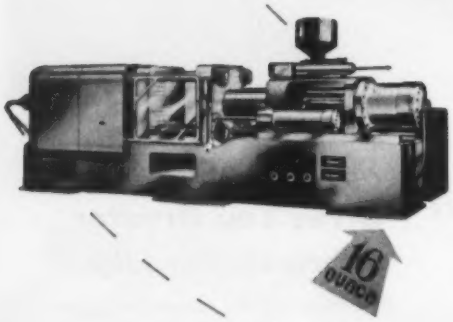
focus on injection moulding machines

PROJECTILE PRODUCTS PECO





THE attention of Plastics manufacturers may profitably be centred on PECO Injection Moulding Machines, for they are designed to give high productivity through maximum efficiency.

They are built in 2oz., 4oz., 8oz., and 16oz. capacities. They represent the most up-to-date development of this type of plant.

Full particulars will be sent on request.

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Buy "Know-How"

The Plastics Industry is rapidly discovering that vinyl dispersion compounds lend themselves to the development of many new products. They are versatile and can be used both as coatings and molding compounds.

The wide range of applications is illustrated by the diversity of uses such as coatings on wire and wire formed objects, cloth coatings, glove coatings, and coatings for metal furniture; to molded objects, such as dolls and doll parts, atomizer bulbs, mannequin parts, electrical parts and many others.

The Watson-Standard Company offers five different types of vinyl dispersions for a wide variety of applications:

PLASTISOLS: Vinyl resins dispersed in plasticizers—considered 100% solids—no volatile material—used both as coating and molding compound—for example, doll and doll parts or textile coatings.

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PLASTIGELS: Gelled vinyl plastisols—may be extruded, calendared, molded, spread or embossed, all of which have excellent retention of detail out of mold and retain their shape during fusion.

ORGANOSOLS: Vinyl resins dispersed in a combination of plasticizers and organic solvent, principally used as coatings, such as coating for textiles, or wire-like objects.

• *Write for your copies of our Technical Papers "Vinyl Organosol and Plastisol Dispersions" and "Slush Moldings."*

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Wellington Sears quality laminating ducks include "Superior"* army duck, chafer fabrics and numerous special constructions. You'll find additional fabrics for both coating and laminating listed at the right. Whatever your fabric problem —let's talk it over...call your nearest Wellington Sears office.

An illustrated 24-page booklet filled with valuable facts on fabric development and applications of interest to present and potential users of industrial fabrics is yours for the asking. Write for a free copy of "Modern Textiles for Industry" to Wellington Sears Co., Dept. 101-J, 65 Worth Street, N. Y. 13. *Reg. T. M.

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TODAY'S

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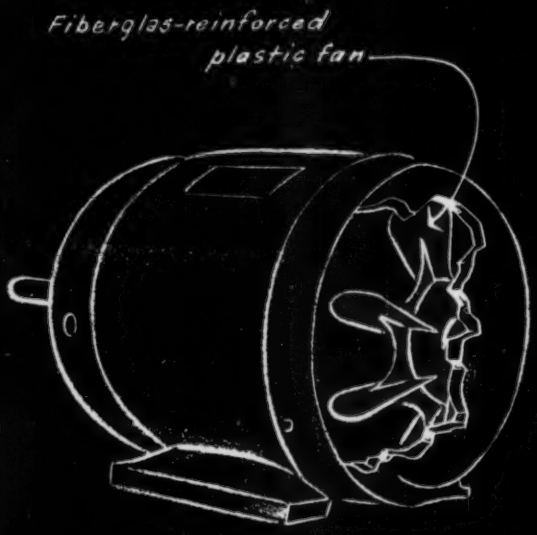
Today, in one compression molding operation, this manufacturer produces lighter, tougher motor fans from a brand new material—plastics reinforced with Fiberglas chopped strands!

Result: no expensive machining—quicker, easier production—a more practical product at lower cost.



TOMORROW!

Grilles, trim, exposed hardware on tomorrow's cars must be handsomely modern, yet tough enough to take the hard knocks of normal road hazards. That's why we believe you'll see future automotive trim fashioned from molded plastics reinforced with Fiberglas materials.

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Receiving — The ingredients to be mixed enter the mixing chamber of drums through a chute. Note scoops which carry up and dump the ingredients as drum rotates assuring a more uniform mix.

Discharging — Throwing a lever closes the inlet and mixer is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients.

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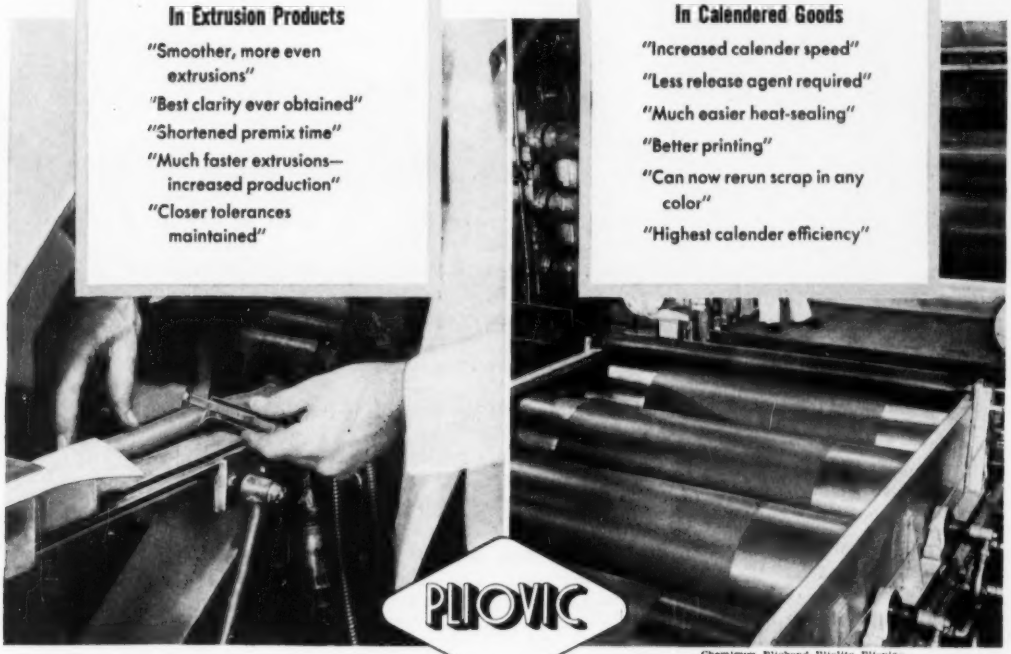

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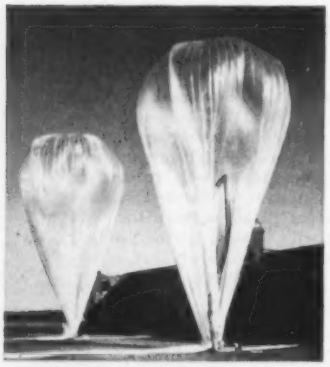

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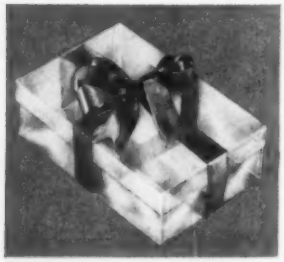

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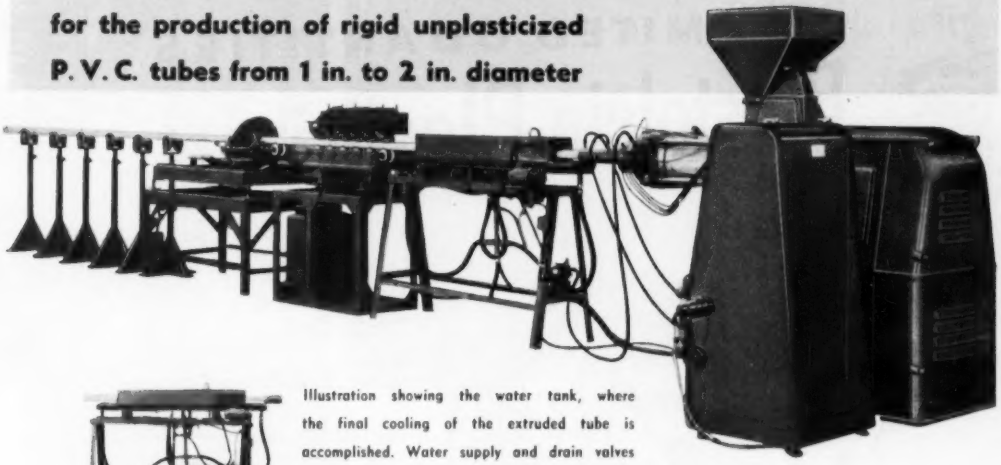
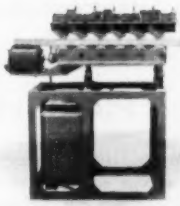


Illustration showing the water tank, where the final cooling of the extruded tube is accomplished. Water supply and drain valves are positioned at convenient locations.

Illustration showing the positive pulling device. The speed is controlled to very fine limits by an electronic variable speed unit. The speed regulator is mounted remotely from the motor and is situated near the die conveniently for the operator.



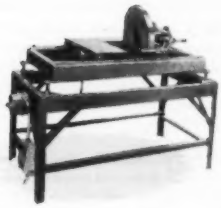


Illustration showing the cutting-off device, comprising a belt driven circular saw mounted on a ball bearing tracked table. Unison between tube and cutting blade is maintained by clamping the extruded tube, which is positively delivered to the moving table by the positive pulling device. Cutting takes place whilst the table is at liberty to move along its tracks. Saw automatically cuts out when not in use.

Illustration showing a yoke type adjustable centering die, with a detachable water cooled former tube. Air is introduced through the mandrel of the die to facilitate blowing tube to size in the water cooled forming tube.

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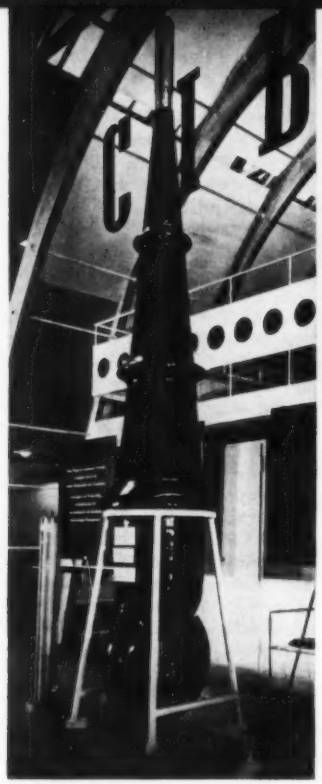


Courtesy Ciba Co., Inc.

Some 2600 lb. of epoxies were used in bonding the components and in the encapsulation of this huge electrical transformer. The potting resin in this case was filled with powdered quartz

Courtesy Shell Chemical Corp.

Epoxy lined tank car is intended for special service in handling corrosive chemicals to guarantee "on spec" quality right up to the moment of delivery to the user's door

EPOXIES—*No Wonder!*

Amazing performance of ethoxylene resins spreads across many fields: bonding at low temperature and pressure; protective surface coatings; potting—and this is only the beginning

THE first time you meet up with the epoxies—ethoxylene resins—your eyes pop with amazement. As for example, when you learn that they will bond titanium to zirconium, plastics to steel, glass to brass, or rubber to rock, at comfortable temperatures, and with the use of little or no pressure.

The second time you may be suspicious in advance, but your ears perk up when you discover their uses in weather- and corrosion- and wear-resistant coatings. As, for example, when you learn that you can put a superior five-mil paint job on an automobile with only two passes of the spray gun, or that you can line a chemical tank car in a matter of minutes.

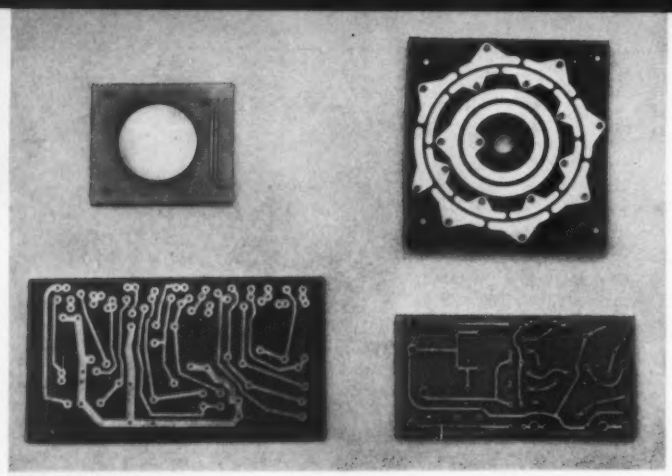
The third time, you're quite blasé and remain deadpan while learning of the uses of epoxies in electronic potting, in electrical miniaturization, and in printed circuits for high voltages.

From then on, every time you hear of a new and spectacular resin application, you are inclined to ask: "Epoxies?"

Epoxies are a little like child prodigies. Their performances generally exceeded what is expected of them even by their parents, the manufacturers. Their versatility has led sales managers and technologists in the field to go around with their fingers crossed!

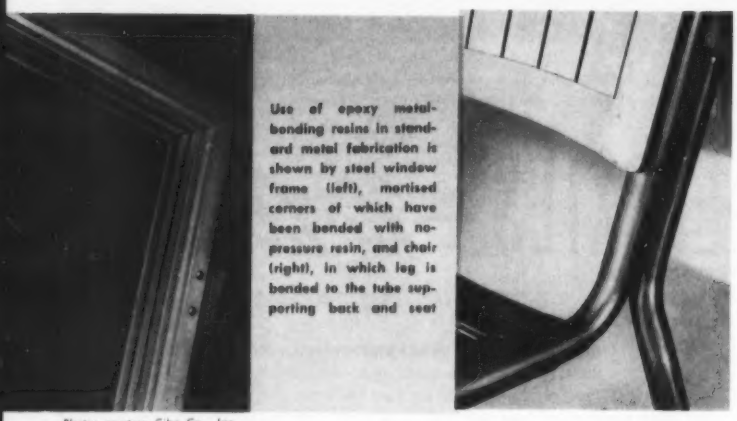
Source of Epoxies

Epoxies are produced in this country from epichlorohydrin, by-product of the production of glycerine from petroleum, reacted with bisphenol A. As pointed out in our Plastiscope department in the June 1952 issue, ethylene glycol and several other chemicals might be used instead of bisphenol, and it seems



Courtesy Photocircuits Corp.

Printed circuits for miniaturized and unitized electronic components are printed directly on laminates prepared by U.S. Polymeric Chemicals, Inc., from Epon impregnated cloth



Use of epoxy metal-bonding resins in standard metal fabrication is shown by steel window frame (left), mortised corners of which have been bonded with no-pressure resin, and chair (right), in which leg is bonded to the tube supporting back and seat

Photos courtesy Ciba Co., Inc.

quite possible that later varieties of the basic ethoxyline resins will be so made.

By completely independent research, the epoxies were developed in Switzerland by Ciba Co., Inc., and in the United States by Devoe & Raynolds Co., Inc. Ciba's approach was in the direction of adhesives and potting resins, and resulted in the first Araldite, which was introduced into the United States by import late in 1946. Devoe & Raynolds' approach was in the direction of surface coatings, paints, and varnishes. Dr. J. S. Long, chemical director of Devoe & Raynolds, drew up on a blackboard a sketch of the molecular structure he desired, and then proceeded to work backwards in creating it. What he was after, basically, was a resin that would prevent deterioration of chlorinated hydrocarbons in paints and varnishes, and which would provide a tough, scuff-proof, light- and chemical-resistant coating with adhesion vastly improved over anything then on the market.

The Devoe & Raynolds resin was called Devran. In 1946, Shell Chemical Corp., manufacturers of epichlorohydrin, under licensing agreement with Devoe & Raynolds, began marketing epoxy resins under its registered trade name, Epon. Shell's interest in epoxy resins developed naturally out of its basic position as a raw material supplier of epichlorohydrin, and because of its long-standing interest in the surface coatings field.

Neither Shell nor Ciba got into mass production in the United States until 1950, so that from a trickle in 1946 and 1947 the epoxies have registered a fantastic growth, with production in this country currently at the rate of more than 12,000,000 lb. per year. At the same time, the price of basic epoxies has come down from around $2 a pound to between 60¢ and $1.50.

Different Approaches

Ciba and Shell have two different approaches to the marketing of epoxies. Shell itself does not produce formulations, but provides four basic surface coating resins and four structural resins, along with a group of amino-type catalysts for various kinds of formulations. Shell does, however, have one completely formulated adhesive, Epon adhesive VI. This was primarily developed for metal bonding, curing at room temperatures with contact pressure, but is also used for the bonding of other materials. Ciba has 200 standard epoxy resin formulations, and is adding to them at the rate of five a month. Currently Ciba is putting a lot of research into new catalysts to give the formulations longer pot life but shorter curing times under higher temperature cures. Ciba is just now announcing a resin which can be shipped pre-catalyzed.

Both epoxy makers appear to be moving toward more horizontal markets; Shell, which until recently concentrated on coating resins, is now moving into laminating, potting, and adhesive markets, while Ciba, which formerly concentrated on industrial applications, is now paying some attention to the coatings field.

Epoxy Properties

The properties of epoxy resins as related to different types of applications have been thoroughly covered in MODERN PLASTICS magazine (November 1950, p. 85, and June 1952, p. 209). Briefly, the epoxies in surface coatings have the advantage of being able to be used with slow drying but less expensive oils, and they can be used in combination with almost any thermosetting coating resin such as phenolic, melamine, or urea. In most formulations the epoxies offer chemical resistance, scuff resistance, high gloss, and sufficient elastomer quality not to chip when struck sharply.

Already the epoxies have invaded the dishwasher field as coatings for the interiors of those machines, where their resistance to alkalies and detergents gives them an advantage; and already experimental application to automobiles is undergoing field tests which look most promising. While the epoxies resist ultra-violet deterioration, their use in colored coatings tends to produce yellowish tones, and considerable research is going on to produce bluish white instead of the yellowish whites now available.

Since epoxies are basically adhesives, it goes without saying that these surface coatings, whether slow-cure air-drying or quick-cure heat-drying, give spectacularly better bonds to metals, woods, etc., than any other resin yet developed.

Some work has been done in this country with epoxies as coatings for the interior of metal cans and drums. Pilot runs of beer cans coated with epoxies are under test at this time. In Europe, a big field has developed in the coating of metal for collapsible tube interiors. To date, no progress has been made in that direction in the United States, but in Canada, Modern Containers Ltd., Ottawa, has done the job successfully and is now tooling up for mass production of collapsible tubes inner-coated with Araldite resin.

In potting, the epoxies have the advantage of amber clarity (about the color of good beer); of fillability with inert materials where lower costs must be attained; of cures from below room temperature to over 300° F., depending on desired cure time, with an almost negligible shrink after gellation; of no-pressure casting; and of complete adherence to the metals, glass, and other materials in potted assemblies.

In the electronics field, the trend toward miniaturization and subminiaturization has been made more practical since the advent of the epoxies.

With the coming of color television, it appears probable that several circuit components which in present television sets are exposed to air and to touch, will have to be potted because of the high voltages that will be used. Ciba is conducting much research in this direction and, further, is doing research on elastomeric epoxy potting compounds. These new modified potting epoxies can be made in formulations which range from rubbery to brittle after cure; the more elastomeric forms reduce the possibility of cracking around heavy inserts. It is literally possible to pot a complete miniature radio receiving set that may be bounced like a ball. Another new Ciba potting resin (known as No. E-134) is capable of taking thermal shock from 130° C. to −40° C. when cast around large steel inserts.

Potted Frequency Filter

A European application for epoxies as potting compounds which has as yet no counterpart in this country is in the frequency filter recently developed for the new coaxial telphone cable which runs from London, England, to Bern, Switzerland, through Paris, France. Some 960 conversations may be carried on one circuit at one time; the frequency filters separate the conversations. Here, the epoxies act as wire insulators, as supports, and as protection against damage; and the complete unit may be made much smaller than it otherwise would have to be.

Minnesota Mining & Mfg. Co., St. Paul, Minn., announces as we go to press two new epoxy-type insulat-

Courtesy Ciba Co., Inc.

Aluminum-wood-aluminum sandwich part cold-bonded (arrows) with epoxy

Courtesy Minnesota Mining & Mfg. Co.

Potted subminiature electronic unit involved use of epoxy-fibrous glass laminate material and epoxy potting resin

Courtesy Shell Chemical Corp.

Chemical resistance of epoxy coating is demonstrated by pouring hot caustic on three pieces of aluminum foil covering beakers. Center piece of foil is coated on top with epoxy; caustic does not attack it. Caustic eats right through uncoated foil (left). Foil at right is coated on under side; caustic eats through foil, is stopped by epoxy coating

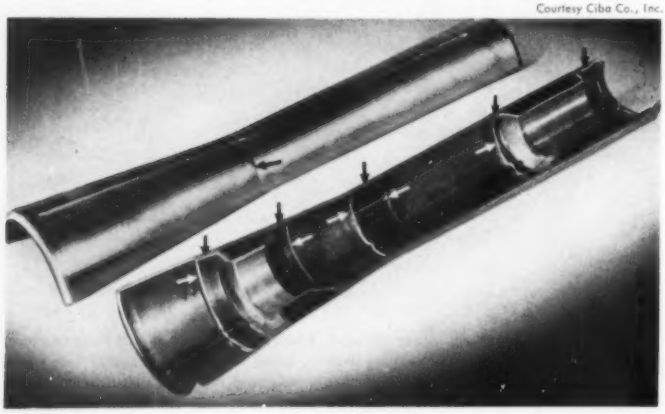
Newest in epoxy resin formulations is an elastomeric material which holds great promise in adhesives where shock resistance is of importance and in potting compounds where components are subjected to vibration and high impact shock

Courtesy Ciba Co., Inc.

Companies dealing with adhesive specialties put up epoxy glues in small packages for industrial work where only limited quantities are used. Kit shown includes collapsible tube of resin, glass vial of catalyst, paper cups for mixing, and eye dropper for adding catalyst to the resin

Four component parts of this aluminum spinning bobbin are bonded (arrows) with an epoxy adhesive. Because the epoxy sets up without pressure, the whole job can be done in one operation; because the epoxy cures at low temperature, the mechanical strength of the metal is not reduced nor can warping occur during the bonding operation which would result in later difficulties in balancing the rotating assembly

Courtesy Ciba Co., Inc.



ing resins for encapsulation and potting of electrical components. These resins, called Scotchcast Nos. 1 and 2, are designed to be used in the manufacture of coils, transformers, resistors, and unitized electronic circuits, as well as for dip impregnation of such items as require increased moisture resistance. Scotchcast No. 1 comes in a solid form with a separate catalyst, and is heated until liquified for pouring into the mold, where it cures at 250° F. in from four to eight hours. Scotchcast No. 2 comes in liquid form with hardener in a separate container, and can be poured into a mold and cured at room temperaturs in three to six hours. Both may be filled with aluminum oxide, mica, glass, or other materials. In the unfilled form they may be classified as Class A insulating materials, and by the addition of suitable fillers may be processed to meet Class B requirements.

Reinforced Plastics

Related to potting because of the electronic field of application is the whole business of fibrous glass low pressure laminates. Here, the excellent electrical properties of the resins plus their adhesive properties give them unique advantage, because the layers of glass fabric are bonded together with shear strengths not otherwise obtainable and with compressive strengths in the range of 70,000 lb.; in the case of printed circuits, the copper sheet is firmly bonded to the laminate.

The business of applying epoxy formulations to fibrous glass and other reinforcements for the making of laminates is a highly specialized one. Such companies as U. S. Polymeric Chemicals, Stamford, Conn., Fabricon Products, Inc., River Rouge, Mich., and Cordo Molding Products, Inc., New York, N.Y., specialize in coating fibrous glass with various resins, and have worked out the know-how for the use of epoxies in this connection. Photocircuits Corp., Glen Cove, L.I., N.Y., specializes in the manufacture of printed circuits from copper-fibrous glass-epoxy laminates.

On p. 96 of this issue will be found an article dealing with a new bomb-damage control development by the U. S. Navy. When a pipe made of steel or other material on a battleship is cracked or bursts, a

"plastic patch" is used to repair it on the spot without removal and with little down-time. No official statements have been forthcoming on the resin used with the fibrous glass in this operation, but it is quite obviously an epoxy.

New Glues

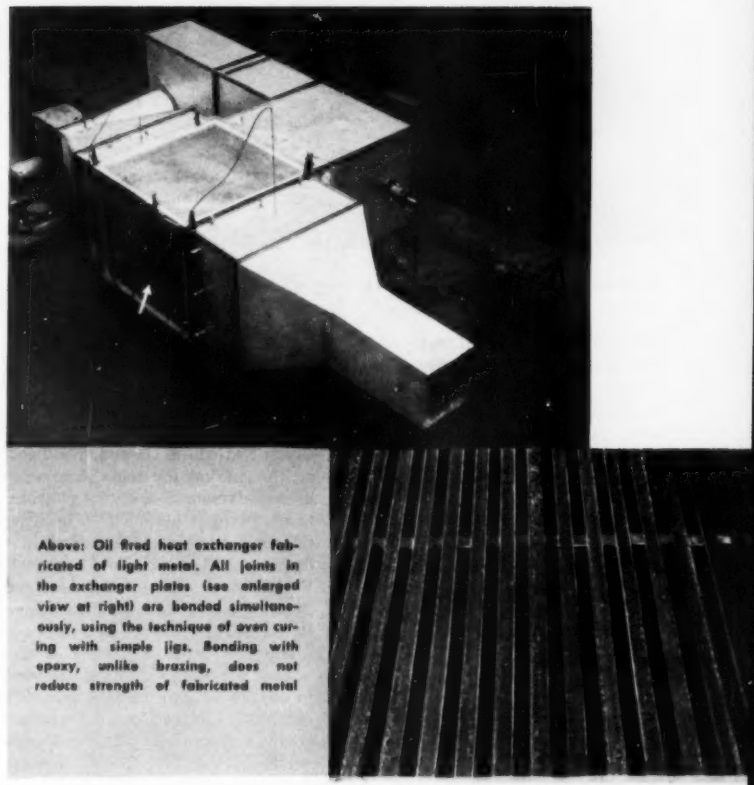
The use of epoxies as industrial resins has resulted in the creation of a whole new breed of glues. In metal-to-metal bonding, the temperatures traditionally used are from 600° F. for brazing and soldering; up to 6000° F. and more for welding. Yet there are thousands upon thousands of cases where it is desirable to bond metal to metal at much lower temperatures. So the epoxies came into the picture to provide bonds at temperatures all the way from freezing to slightly above boiling.

As adhesives, the epoxies by themselves are rather expensive, but such thin glue lines and such low pressures may be used that the price may be forgotten for the results. And such are the dielectric properties of epoxies that aluminum foil may be bonded to brass foil with no electrolytic interference.

Progress in formulation and application of epoxy adhesives is going on in two different directions. First, adhesive specialists such as Armstrong Products Co., Warsaw, Ind., are taking the basic resin and formulating it into specialty glues, putting it up in both small kits and big lots for industrial end-users such as motor manufacturers, radio makers, refrigerator people, etc. Amstrong has five epoxy adhesives with varying cure times and end properties for specialized purposes.

Specialty Resins Corp., Los Angeles, Calif., Houghton Laboratories, Inc., Olean, N.Y., and Cycleweld Div., Chrysler Corp., Detroit, Mich., are others developing new adhesives on this principle.

On the other hand, some companies with long experience and wide connections in the welding, brazing, and alloy fields, are taking up epoxies. An agreement has just been signed between Eutectic Welding Alloys Corp., Flushing, N.Y., and Ciba, whereby Eutectic processes, develops, and merchandises Araldite adhesives in the metals field. The ChemoTec Div. of Eutectic has its own formulation laboratory and will have its own field service organization, using the company's regular sales force for distribution. Officials of the company point out that the lower temperature bonding of metals made possible by epoxies was only a small factor in their decision to enter the field. Highly skilled labor is required for welding and brazing, and this is not generally available in places to which the metal working industry is moving. With epoxies, it is possible to do quality work in metal bonding with the use of relatively unskilled labor. Using female labor, quickly trained, the savings more than offset the higher cost of epoxies for bonding.



Above: Oil fired heat exchanger fabricated of light metal. All joints in the exchanger plates (see enlarged view at right) are bonded simultaneously, using the technique of oven curing with simple jigs. Bonding with epoxy, unlike brazing, does not reduce strength of fabricated metal

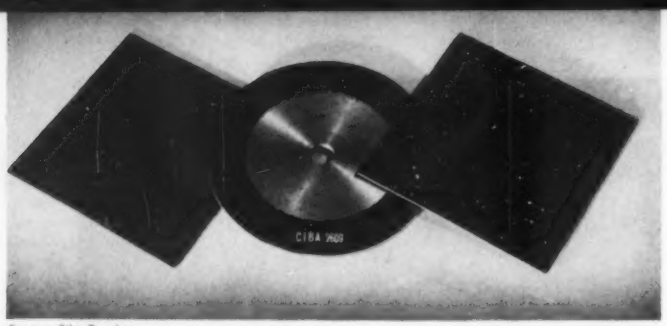
Courtesy Ciba Co., Inc.

As Stabilizers

As mentioned above, the epoxies have the ability to lend stability to chlorine-containing materials, particularly chlorinated hydrocarbons. This is of particular importance to the paint industry, where more

Courtesy Ciba Co., Inc.

A strip of GR-S synthetic rubber was bonded to a strip of aluminum-magnesium alloy; under high stress the rubber will rupture before the glue line



Courtesy Ciba Co., Inc.

Abrasives, diamond chips, etc., are bonded to metals with epoxy adhesives

chlorine is being used every day. The epoxies are also of growing importance as polyvinyl chloride resin stabilizers, where they give nontoxic properties to film made from the resin, where they impart resistance to discoloration on heating, and where they help to achieve better clarity and light resistance. In this application they are generally used with metallic components, such as barium and cadmium.

Starting with coatings, following with adhesives, and now in the case of potting materials, it has been only sound economics to take advantage of the compatibility of epoxies with lower cost thermosetting resins. In coatings they blend well with melamines, ureas, phenolics, and alkyds. In adhesives and industrial components, the concentration has been on phenolic-epoxies. An interesting point in this connection is that each variation of epoxy will pick its own preferred phenolic out of a range. Almost every phenolic material maker in the country is working with phenolic-epoxy materials along several different lines. Bakelite Co., Div. of Union Carbide & Carbon, has been on the market for some time with its now-famous C-8 epoxy phenolic resin. In pilot plant stage to date, this is a complete resin manufacturing operation on Bakelite's part. Various C-8 resin formulations are going into molded laminates, adhesives, and potting resins.

Durez Plastics & Chemicals Co. offers its resin 15956 which is used in combination with Epon resin 1007 especially for chemical resistant coatings such as linings for chemical equipment and piping, coatings for laboratory and hospital furniture, linings for storage tanks and tank cars, drum linings, can linings, and wire coatings. The Chemical Div., Borden Co., offers two epoxy-phenolic resins—Epiphen XR-881 and XR-823—one a coating-type formulation and the other an adhesive and industrial material. Monsanto Chemical Co., while not offering an epoxy-phenolic combination, has a special phenolic resin, P97, which was developed for the purpose of mixing with epoxies for making coatings. The Chemical Div., General Electric Co., also has a phenolic resin compatible to epoxies. This is the GE R-108.

Catalin Corp. of America is coming into pilot stage with epoxy-phenolic industrial resins. Marblette Corp. is conducting basic research preparatory to entering the lists. Plastics Enginering Co. and Loven Chemical have made no announcements to date, but may be expected to join the parade.

New Markets

The pay-off in epoxies, of course, is probably going to be in the direction of much less spectacular applications than potted electronic sub-miniatures, bounceable radios, and motors that will run under water. If and when the automotive industry takes on the epoxies as automobile paints, a huge field will open up. If and when the refrigerator makers realize that they can bond metal parts of a refrigerator with epoxies and lengthen the life of the unit by using epoxy coatings, another big market will be found. If and when the makers of insulated glazing units take on epoxies to replace brazing and as permanent airproof gasketing material, still another market will come up.

For the present, the epoxies are in pilot use in a thousand applications where they are getting most severe testing. They are bonding metal sheets to steel frames for elevators, they are bonding steel legs to rubber pads to reinforced plastics seats in the well-known Eames chairs, molded by Zenith Plastics Co., Gardena, Calif. As already mentioned, they are moving into interior coatings for collapsible tubes. And their uses in potting and printed-circuit material are receiving the daily attention of technicians in the communications field and in the television industry.

There is much yet to be learned about them, but as each new problem in application is overcome, engineering comment will be: "Epoxies—no wonder!"

Courtesy Ciba Co., Inc.

Flange is bonded to a tube with an epoxy adhesive. In such bonding operations it is found that the epoxy flows in a manner similar to that of solder

Fire Extinguisher Housed in Urea

Fire extinguishing unit housed in a three-piece case molded of urea hangs from ceiling, operates automatically when certain temperature is reached

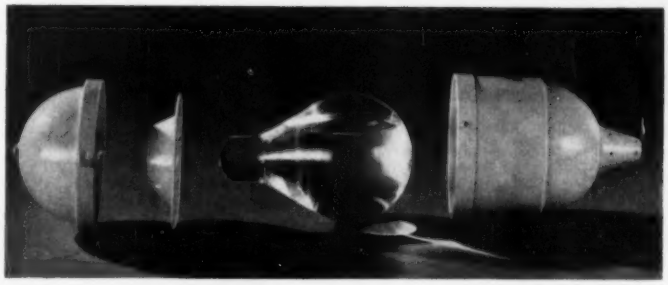
A SUBSTANTIAL step forward was taken by a manufacturer of an automatic type of fire extinguisher when a switch was made from metal to plastic for the housing. This fire extinguisher is of a type designed to be hung from the ceiling and to automatically go into operation when the ambient temperature increases beyond a certain point. According to the manufacturer, Red Comet, Inc., Littleton, Colo., the switch to plastic gave extra freedom in design, advantages of durability, freedom from corrosion, lighter weight, and eliminated problems of welding, riveting, and painting. Material and direct labor costs were reduced 35 percent.

The housing of the extinguisher, known as the Red Comet Safety Automatic Fire Extinguisher, is molded of Plaskon urea in both ivory and red. It is produced in three pieces by the Seder Plastic Corp., Fort Collins, Colo. The case itself is thus fire resistant and is unaffected not only by the fire extinguishing fluid itself but by all commonly encountered cleaning fluids, soap, etc. Because color is integral with the material, the case retains its colorful luster indefinitely.

As one of the photographs shows, the three plastic parts of the unit enclose a sealed glass container of fire extinguishing fluid. In the bottom end of the housing is mounted a fluid release mechanism incorporating a fusible clip which breaks when heated, releasing a powerful coil spring which shatters the glass, releasing a fire smothering fog.

Attractively styled, fire-resistant urea housing is lightweight, durable, and free from corrosion

Production costs for original metal housings were 35% greater than with urea



Three urea parts of housing enclose glass unit containing fire extinguishing fluid; fusible clip in bottom of housing breaks when heated, releasing spring that shatters glass

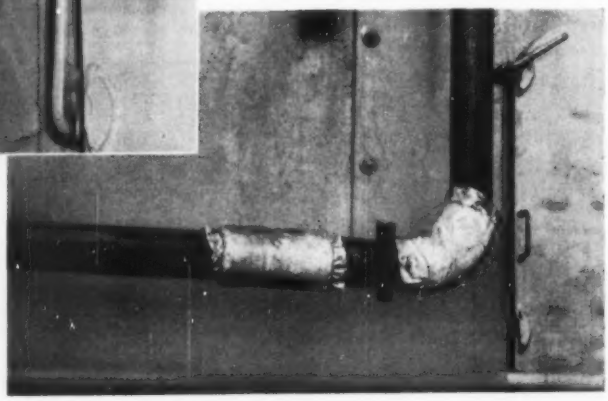
Plastic Pipe Patches

Tape for holding repair patch in place is carried on spool through activator

Damaged area is covered with cured patch of resin-impregnated Fiberglas

Activated tape is then wrapped around patch, overlapping it by several inches

To speed up cure, bat of activated Fiberglas mat is tied in place around the repaired area



Patch on straight length of pipe and one on elbow were completed in a matter of minutes

RESEARCH at the United States Naval Damage Control Training Center, Philadelphia, Pa., has resulted in the development of a plastic patch kit for damaged pipes; the patches have all the functions of first-aid bandages for wounds.

Specifically adapted to ship-board use, the repair method is satisfactory for all types of piping, with the exception of pipes used for transmission of high temperature steam and liquids. The patches are eminently suitable for handling 300 p.s.i. consistently, and under ideal conditions even higher pressures can be handled successfully. Odd-shaped bursts and jagged protrusions are no obstacle.

The use of this patching method permits emergency repairs in a fraction of the time it takes to repair pipes by the more usual methods such as welding.

The Navy credits Cordo Chemical Corp., Norwalk, Conn., for the development of the plastics resins, and Owens-Corning Fiberglas Corp., New York, N.Y., for the development of the fibrous glass products used for reinforcement.

The special kits contain the reinforcing materials in tape form, impregnated with a special resin, and in putty form, composed of chopped glass fibers mixed with a special resin. Small cans of required activator are also supplied as well as a special spooling device used to carry the tape through the activator.

Pre-printed vinyl sheet is vacuum formed on cast phenolic die to make holiday display counter sign over 22 in. long. Forming die is shown in the background

Right: One method of producing cast phenolic dies involves the use of vinyl elastomer molds. After curing, the die lifts easily out of the flexible mold

Cast Phenolic Dies for Sheet Forming

Limitations of wooden or plastic dies are overcome by use of casting resin which faithfully reproduces details of original model

MASS production techniques for pre-printing and heat-forming thermoplastic sheets as developed by Stanley Wessel & Co., Chicago, Ill., have pointed to a definite need for a superior forming die material which can be easily handled and would not have certain limitations inherent in wooden or plaster of Paris dies. As a result of its search for such a material, this company has adopted a phenolic casting resin made by The Marblette Corp. Currently, Wessel uses dies of this type for about one-third of the items it manufactures.

Wessel specializes in the production of a variety of three-dimensional formed sheet products ranging from small nursery plaques, signs, and point of sale displays to its own extensive line of internally lighted Christmas decorations, including large Santa Claus heads and full length Santas ranging from 11 to 28 in. high. Most of these items, vacuum formed on a battery of presses, are decorated by silk screen process or lithography prior to the forming operation. The combination of printing in attractive colors on white rigid Vinylite material and three-dimensional forming produces finished parts having startling depth and realism. But Wessel has found—as have other companies in the sheet forming field—that the final product can be no better than the die in which it is shaped.

Rapid Tooling Needed

In order to gear its activities to highly seasonal items and to the swift tempo of the merchandising field, Wessel must be able to tool up rapidly for new jobs without sacrificing quality in the ultimate product. Basically, this involves the creation of a full-size male prototype or model of the desired sign, display, or other object, and its translation into one or more dies on which pieces may be vacuum formed. The customary procedure is to model the prototype in clay or fabricate it from wood if it lends itself to shaping with standard wood working tools. From the completed original, an intermediate female replica is then cast in plaster of Paris or other suitable material. The final stage covers the production of a finished die from this intermediate cast.

Wessel confines its use of the cast phenolic dies primarily to those of relatively small or intermediate size in which accurate production of close detail is essential. Until the development of phenolic casting resins for this type of work, large, relatively heavy dies, where less detail is required, were usually made of plaster. Size alone, however, is not the only determining factor in Wessel's choice of die materials; one cast phenolic die recently created for a "Merry Christmas" sign measures approximately 22½ in. long. Except for very large parts, the higher material cost of a

All illustrations with this article courtesy The Marblette Corp.

First step in making cast phenolic die for sheet forming is to pour mixture of resin and hardener into female plaster mold. Original model is in background

Phenolic casting resin can be cured in an oven or at room temperature, depending on time and percentage of catalyst

cast plastic die, as compared to one made of plaster, is not a serious disadvantage in view of the benefits gained by its use.

Important Advantages

As explained by W. J. Higgins, plant manager for Wessel, the cast phenolic dies offer a number of important advantages over dies made of other frequently used materials. For example, their extreme smoothness and faithful reproduction of detail from the intermediate plaster cast help to eliminate minute surface imperfections present in calendared vinyl sheets. Much less fragile than plaster of Paris dies, those of cast phenolic are not likely to become damaged in ordinary handling in the shop, removal from the mold, mounting in the press, etc. Whereas plaster dies have an annoying tendency to break down and chip around the margins, where a sharp cut-off is necessary, the phenolic dies retain their edges almost indefinitely if handled with reasonable care.

Wessel does not make much use of wooden dies, pointing out that except for geometric designs which can be cut out with saws, lathes, and other regular wood working tools they are difficult and costly to fabricate. Cast dies are much easier to produce, since the material may be cast in liquid form directly into a suitable mold and allowed to harden.

From the production standpoint, phenolic dies are made in a manner similar to that employed for plaster dies; the casting material is also introduced into the mold in liquid form and hardens in a relatively short time, either at room temperature or upon the application of moderate heat.

Another advantage of phenolic casting resin over plaster is that additional material may be added to the phenolic dies if it is necessary to modify the design of the finished part. This is difficult to accomplish with plaster because no satisfactory bond can be made between the original mold and the section to be added. The freshly cast plaster will not unite closely with that already set up. With a phenolic die, additional material may be easily added by placing a small dam or enclosure on that part of the die where the addition is required, then introducing liquid resin having the proper proportion of hardener. Upon curing, this section becomes an integral part of the die and can then be shaped as required for the part modification. It is cured in the same manner as the original die, as detailed in the following paragraphs.

In its work with cast resin dies, Wessel uses Marblette Resin 69 in conjunction with Hardener 342, which is an accelerator or catalyst. Resin 69, a clear, colorless liquid supplied in lined drums, is of low viscosity and great stability. Its storage life at 70° F. or below is approximately eight weeks. During the hardening process this resin (to which accelerator has been added) becomes milky in appearance and sets up as a hard white or ivory colored material. The usual procedure is to add 10% hardener to the resin (1.6 oz. or 38 cc. per lb. of resin). Resin and accelerator are thoroughly mixed at room temperature to obtain maximum dimensional stability in the finished casting. Marblette Corp. recommends that the mixture be permitted to stand for at least 15 min. so that bubbles created in the stirring process can rise to the surface. At room temperature, the mixture will remain in liquid form for several hours.

Release agents recommended for plaster of Paris or wooden molds include materials made by U. S. Stoneware Co., Akron, Ohio, and by Elastomer Chemical Corp., Nutley, N.J., and others.

Curing

Depending upon the time element and other factors, Wessel follows two methods of curing the cast resin dies. Using a 10% proportion of hardener, the molds may be cured in an electric oven in from 1½ to 2 hr., with heat regulated at from 120 to 160° F. At the end of this period, the casting may be easily withdrawn from the plaster mold. Although the plastic dies may be mounted and used in the press immediately upon removal from the mold, they actually post-cure for some time afterward, developing their ultimate hardness during this period. In the absence of heating equipment, the castings may be cured at room temperature. When using this method, a higher concentration of hardener (25%) is mixed with the resin and the castings are permitted to cure overnight. Castings made by this process are some-

After curing, phenolic die is easily removed from the mold because of parting agent used on plaster surface

Cast phenolic die being mounted in vacuum press; multi-cavity operation is obtained by mounting several dies on one bed

what softer and less durable than oven-cured pieces.

Since many of the sheet forming jobs handled by Wessel call for multi-cavity operation, several duplicate phenolic dies may be cast successively in the same master female intermediate mold and mounted in groups to take full advantage of the forming capacity of the press. They are usually mounted on a wooden die base by means of an adhesive so that individual dies can be removed from the base if necessary.

In the accompanying series of illustrations, the step-by-step production of a representative cast penolic die in the Wessel plant is pictured, along with views of sheets formed with such dies. The nursery rhyme plaque shown is one of a group made by Wessel for the Levinson Mfg. Co., Pawcatuck, Conn., which fabricates them into juvenile night lights. Formed in a multi-cavity cast phenolic die, using 0.010 in. Vinylite extruded sheet material, the plaques are lithographed in four colors prior to the forming operation and are later cut into individual units. The trimmed size of the finished plaques is approximately 5⅛ by 5⅝ inches.

Although most of the phenolic dies made by Wessel have been cast in plaster intermediate molds, the company has also done some recent work with vinyl elastomer molds, made of Koroseal by Perma-Flex Mold Co., Columbus, Ohio. Molds of this type work out well for small, highly detailed items. Rubber molds may also be used.

Accuracy of detail obtained with cast phenolic dies is evident in this formed sheet. In this job, sheet will be cut into units which are used in making juvenile lamps

Resins Extend the Forests

Plywood, laminated timbers, and conversion of wood waste offer increasing markets for plastics. The products of these unions, in turn, offer new properties to designers and other users of wood. Farms, homes, and industry will all benefit

by R. D. BEHM†

Use of plastic-bonded plywood and timber laminates on the farm is expected to be a big factor in the growth of the industry. Left: All-plywood silo and barn in the state of Washington

Below: An all-plywood home built by a home craftsman has received wide acclaim as a practical application of the material. It was built by Tom Riley and *Popular Mechanics* magazine in Oregon

WHAT basic patterns are developing for the use of plastics in the forest products industry? What volume factors can be anticipated? The answers to these questions are of great importance to every chemical and plastics manufacturer.

The writer will endeavor to furnish the answers by presenting an examination of the principal markets which show a 10% increase in the past year in the use of phenol for resin adhesives by the softwood plywood industry and equally interesting increased uses of other plastics by many segments of the lumber industry. A clear picture will be presented of the plastics materials now being used, and market trends and certain objectives of advantage to both the plastics and the forest products industries will be pointed out. The examination will bring out the natural affinity of these two industries and the interrelation of the component materials in a competitive market. An understanding of these factors should aid in evaluating the future markets for plastics in the forest products industry and should be of assistance in directing research programs.

† Factory Representative, M and M Wood Working Co., Portland, Ore.

Volume Growth

Greatest impetus to the use of plastics in the wood industry occurred in the middle thirties, with the introduction of the hot plate pressing method of making plywoods and the use of the phenolic type adhesives. This combination of thermosetting plastics and wood fiber brought about a new era of use and development. The growth in volume of exterior type plywood is indicated by the accompanying tabulation of expansion as reported by members of the Douglas Fir Plywood Association.

In 1942 the M and M Wood Working Co. started using a percentage of phenolic resin in animal blood adhesives to give more water-resistance to interior type

plywood. As a result, the use of phenolic resin is no longer limited to exterior type plywood. Some mills, including those in British Columbia, are using phenolic resin base glues exclusively. As much as 3 to 4 million lb. may be used annually for this purpose. The 1952 plywood requirement for phenolic resin is expected to exceed the record year of 1951 and to be ten times greater than 1941.

The growth in the Douglas Fir Plywood Industry—with its proportionate increased requirements for plastics—is a result of applying engineering and design techniques to sales efforts in developing markets. Current indications are that the sales outlets of exterior plywood will continue to grow because of the expanded field of use of this material for industrial components, for re-usable concrete forms, in home construction, and on the farm. The same growth parallel can be expected in laminating timbers, as this new and lusty offspring of the forest products industry reaches maturity and demonstrates the efficiency of new design principles. A similar growth in plastics requirements may occur in the conversion of wood waste fibers where both thermoplastic and thermosetting materials have a place.

Renewable Material Source

Trees are the greatest of our plant structures. Our forests differ from other material resources in that they are renewable, are constantly being replenished. Under good management, they are an inexhaustible reservoir of great economic value. They form the basis of the fourth largest industry in our country. Recent improvements in forestry practices has shown tree farms to be an economic and practical business. For example, a single redwood seed, so small that 3000 will weigh but one ounce, can grow to produce as much as 50,000 cu. ft. of harvestable wood, as in the case of the General Sherman tree in California.

The annual harvest of forest crops exceeds 10 billion cu. ft., or over 180 million tons. This is many times greater in volume than steel and almost double the full production of steel products by weight. In addition, many millions of tons are discarded as waste products waiting for developments, perhaps through chemistry and plastics, that will make them into usable products.

Though the Mesabi Range deposits of iron ore are almost exhausted, the new forest growth each year approximately replaces that which is harvested. True, some of the virgin stands of huge defect-free trees are being depleted, but this situation calls for inventive practices as well as for the addition of plastics materials to make large and equally strong wood members from wood segments which can be obtained from smaller trees.

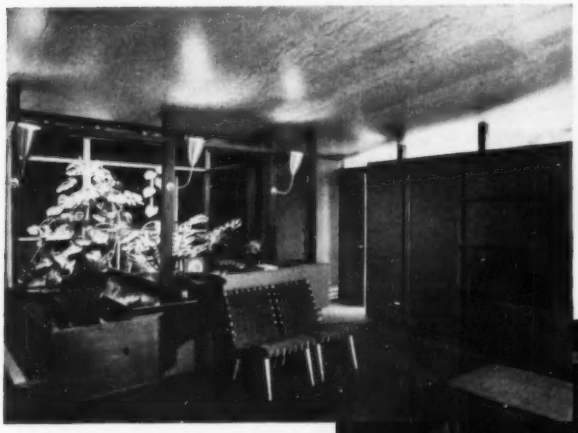
With an abundance of replaceable raw materials having natural strength properties, why has the lumber industry not progressed more rapidly? Among the many excuses proferred, one statement car-

Douglas Fir Plywood Production 1928-1951[1]

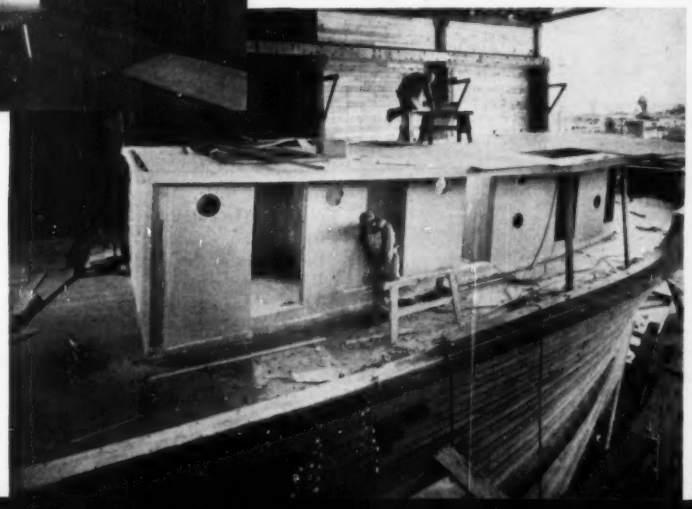
In million sq. ft.-⅜ in.-3-ply

1928	276	1940	1,200
1929	358	1941	1,620
1930	305	1942	1,782
1931	235	1943	1,430
1932	200	1944	1,440
1933	390	1945	1,200
1934	384	1946	1,305
1935	480	1947	1,630
1936	700	1948	1,871
1937	725	1949	1,889
1938	650	1950	2,554
1939	950	1951	2,700

[1] Figures as reported by members of Douglas Fir Plywood Association. Additional softwood plywood in area, including western pine, redwood, spruce, etc., 285 MM. Canadian mills 340 MM. Grand total, 3325—an all time high production mark. Exterior type increased from 525 MM in 1947 to 830 MM in 1951. Capacity now over 1 billion.



Modern interior by Whitney R. Smith, architect and builder in Los Angeles, Calif., makes lavish use of plywoods



Tuna boats must be able to take terrific punishment, so plywood and laminated lumber are used in this "Tuna Clipper" by Western Boat Building Co.

ries a lot of conviction. Since wood is not a homogenous substance and each piece is different, design criteria have always called for excessive factors of safety to make up for the variables. This over-design costs money and adds extra weight, so that competitive materials have entered certain of the markets which have historically been dominated by wood. Even so, the forest products industry production is near its all time high.

Great Strides

The great strides made by the plywood industry are due in part to the fact that uniformity in performance is achieved to a marked degree by lamination. Construction design tolerances can be closer with resultant lower weight and cost factors. The same improvement can be accomplished by the lamination of timbers and trusses, which brings in another application of plastics in the lumber industry. By a more economic selection of grades of lumber used in laminates and by better design practices, many of the old lumber markets can be recaptured through the use of plastics and new markets can be developed.

If plastics materials can be such a major contributing factor to the progress of the lumber industry, why not use plastics alone? The answer is simple. Wood is the strongest material by weight in the world. In volume it remains the most readily available and the least expensive. Because it does not expand and contract measurably with changes of heat and cold, it can create a more stable product—if, of course, moisture content can be made constant, which is another job for plastics.

Then, too, economics must be considered. For example, in some processes now under development for wood fiber pressed boards, the plastic additive represents twice the cost of the wood fiber content, but the weight of the plastic is less than ⅛ of the wood. Even the low cost urea resin materials are many times more expensive by weight than the wood fibers.

Technical experts in the plastics field are familiar with the almost endless variety of products with special properties which have been developed through chemistry. How much do they know about the 20,000 species of trees and their various products? Sixteen different types of trees growing in the United States are so heavy that when dry they will not float. Others such as balsa and tano are figuratively as "light as a feather." A recent study by Yale University has shown that a South American wood, knealheart, is twice as strong as aluminum, but only half as heavy. Such a variety of woods gives ample opportunity to design for specific use requirements by proper application of plastics and selected wood fibers. New markets will be developed as advantage is taken of laminating and plywood manufacturing techniques to use the dense and abrasive- and corrosion-resistant species of trees as surface areas, and the lighter species as core material.

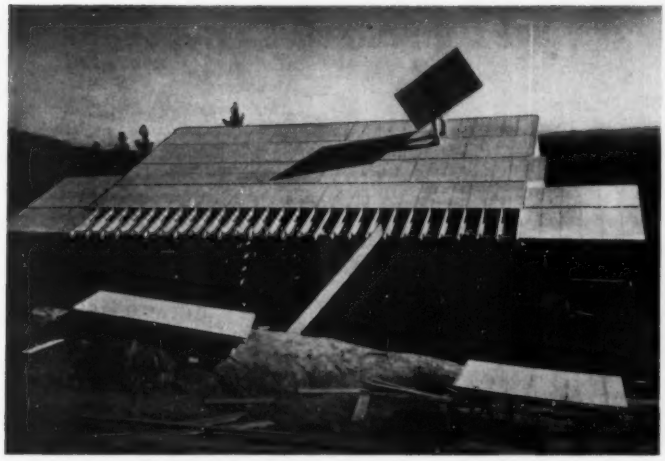
Sailboat sides and bottom are of vertical grain Douglas fir plywood, glued to the frame. Vertical grain plywood does not have objectionable grain rise, insures smooth finish which pays off in sailing competition. Mast is of resorcinol laminated lumber

Below: The large size and high rigidity of waterproof exterior plywood prompted its use in prefabricated grain bins. Such structures prove that plywood can play an increasingly large part in handling and protecting the nation's stockpiles of foods and other materials

Wood Alloys

A new age of alloying in wood is at hand. Just as metals are combined to improve basic properties, so will woods and plastics be combined for new economic advantage and utility.

The possible number of combina-



Plywood roof sheathing for homes goes down in large panels, saving nails and time, cutting construction costs. Similar savings are realized by the use of plywood for sub-floors

Use of wood laminates in railcar foreshadows other applications in transportation

tions of plastics and wood fibers is astronomical. The plywood industry used 40 million lb. of phenolic resin (dry weight) during 1951 and usage will probably increase in 1952. More than 40 million lb. of urea formaldehyde resin were also used by this industry during 1951. Closely allied to plywood are the hardboard and resin-impregnated paper products. Recent developments in these fields forecast greatly accelerated requirements for phenol, urea, resorcinol, and melamine, and their derivatives and modifications.

Surface treatments for wood products using alkyd resins, pentachlorophenol, and clear plastic resins have become standard practice in many areas and may soon be established mill operations. Pressure as well as surface treatments with preservative and fire retardent chemicals increased sharply in 1952 and requirements are expanding. A plastic surface treatment with an alkyd resin base for concrete forms has been developed that enables the forms to be "cracked off" and reused time and time again without recoating. There are many other applications of plastics, each with its particular properties as required by the specific end-use of the product. It would be impossible to cover all of them in this article but an examination of some of the major markets where expansion is expected to be most rapid will indicate the variety and scope of possible wood-plastic combinations.

In Transportation

It is a safe assumption that wherever light weight and rigidity are required, plywood and wood products in combination with plastics will find a ready market. In every phase of transportation, payload is all important, and the 500 lb. of metal which could be saved by a one-piece plywood floor for highway transports means 500 more lb. of payload. It wouldn't take many trips to prove the value of such construction.

The shipment of fresh produce and frozen foods across the country is increasing every year. Fifteen years ago the railroads found the rigidity, light weight, and insulating properties of plywood ideal for the construction of refrigerator cars. Phenolic resin bonded plywood, often treated at the factory with a resin sealer, has an excellent record of performance, and is today the favored construction material. Some big operators of refrigerator cars have used vertical grain fir panels for the outside; others are using phenolic resin impregnated paper as a surfacing material to increase wear resistance.

A recent major development in railroad car construction was the "Unicel" car, designed by the Pressed Steel Car Company, New York, N. Y., which is a completely laminated construction using plywood and lumber. This same company has developed highway trailers using the same design principles, and more recently a mobile housing unit. Tests on the railcar over a period of more than a year show that it withstands the shock of "humping" better than steel cars. Plywood and wood laminated construction for all types of transport vehicles can be expected to increase, particularly as state enforcement of load limits becomes more severe. An interesting example of this trend is the experience of Union Freightway, Omaha, Neb., which recently replaced the aluminum side panels on their trucks with plywood side panels.

Transportation by air is increasing in volume, and here again wood-plastics technology can be expected to find welcome acceptance. Strong yet light-weight containers of plywood have been a favorite of the Air Force. Recent improvements in methods of fastening the corners eliminate bulky cleats and save space. One method, originally designed for boat construction, uses layers of glass cloth bonded with saturated polyester resin to the plywood sides and ends.

A spectacular use of plywood and wood laminates which is related to the field of airborne transportation is the parachute drop-board. Jeeps,

heavy artillery, and even tanks are dropped from huge transport planes with the plywood board absorbing the initial shock of contact with the earth and dissipating the stress over the whole area. If the impact were permitted to be concentrated at one point, it could well break an axle or otherwise damage the equipment. In most of these uses, phenolic resin is the preferred plastic bonding material because it is low in cost and unaffected by moisture or weather, acid or solvent. For some packaging needs, urea resin fortified with melamine is satisfactory.

In Construction

The construction field has long been the principle outlet for wood products. Recently metal products have entered the field as competitors. Serious-minded leaders of the lumber industry look to the combination of plastics and wood fiber to reclaim a good share of the market. Already, laminated wood beams bonded with resorcinol, urea, or toxic-fortified casein glues are being used interchangeably with steel I-beams. Engineered wood trusses proved their utility during World War II. In some cases, improper control factors resulted in slightly higher than normal maintenance costs, but new glued laminate techniques should answer this problem. As soon as production volume increases, initial costs will come down. Currently, wood trusses and beams are competitive with steel in timber producing areas, but transportation makes them slightly higher in cost in the highly industrialized area east of the Mississippi. The recent price increase in steel should serve to equalize this differential.

Fire-Resistant

Of paramount importance in warehouse construction is the performance of wood beams in event of fire. At a recent convention of firemen it was stated that fire fighters would enter warehouses with wood beam construction and fight fires from the inside, whereas they considered steel-supported warehouses dangerous because of the possibility of collapse as a result of the heat. It is imperative that the wood beams be laminated with a phenol or resorcinol adhesive which is not affected by temperature. Where best fire-proof qualities are desirable, the plywood and wood members can be treated with any one of several different types of fire-retardant chemicals, although generally such treatment is not necessary.

Requirements for big timbers for warehouses, aircraft hangars, etc. are estimated at 600,000,000 bd. ft. annually for military and military supporting construction alone. Civilian needs are also huge. It is becoming increasingly apparent that solid members will not be available and a big share of this volume will have to be laminated. Current industry production is expected to increase threefold; obviously the resorcinol, urea, and casein adhesive requirements will also increase. Some leaders guess that 5 million lb. of resorcinol adhesive (about 1,300,000 lb. of resorcin) will be needed for structural laminates as the airbase program rolls into high gear.

Another big outlet for plastic bonded plywood and wood products is for concrete form construction; 300 million sq. ft. of plywood alone went for this purpose in 1951. A recent program inaugurated by the Douglas Fir Plywood Association establishes an exterior phenolic resin bonded plyform for multiple use. At the same time it was determined that the moisture resistant grade should be fortified with a pentachlorophenol or phenolic resin additive.

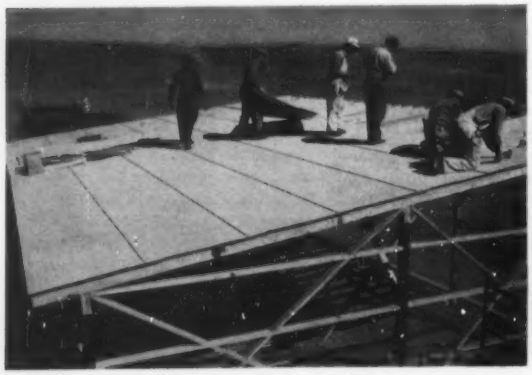
The use of plywood web trusses and membranes may also be greatly accelerated. In earthquake, hurricane, and tornado areas it has long been recognized that plywood construction offers greater protection than other types of building construction. During storms, plywood buildings have been known to be picked up bodily, carried through the air, and set down without damage. These same factors would be important in the blast area around an atomic explosion.

Home Construction

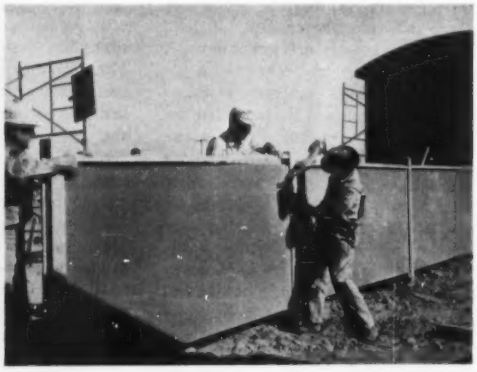
The use of the new wood plastic technology in home construction is certain to increase. Already several firms are making laminated cedar siding with phenol and resorcinol adhesives. Striated plywoods and hardboards are competing successfully with the asbestos and asphalt shingle siding material. Soffits, ga-

(*Continued on p. 191*)

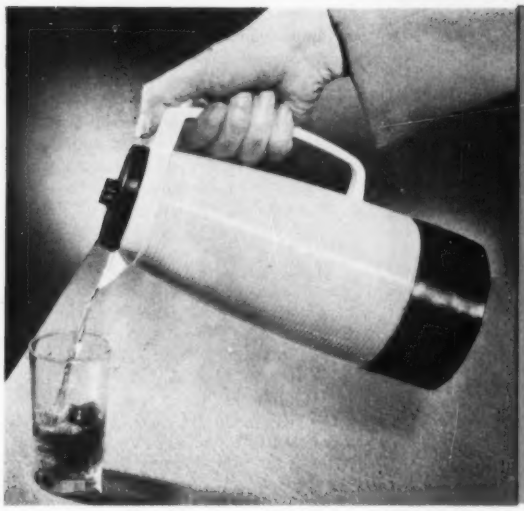
In chicken houses and cattle sheds, plastic surfaced plywood panels, lapped like shingles, eliminate the need for applying other roofing materials



Windbreaks made up of posts and plywood panels screen outdoor living areas, knit visual lines of house into building site



Vacuum Bottles in the Modern Manner



Durable vacuum pitcher molded of high impact styrene incorporates a unique closure that prevents over-pouring and insures a steady flow

High-impact styrene vacuum bottle will keep liquids or foods hot or cold over an extended period of time, has a wide mouth for direct eating

CLEVER design, close attention to mold-making details, use of the most modern molding techniques, and selection of modified styrene materials which have both high impact strength and high heat resistance have been combined to produce two outstanding additions to the vacuum bottle market. These units—a vacuum pitcher and a wide-mouth vacuum bottle—both have bodies, bases, and lids molded of styrene. In fact, they are all-plastic with the exception of the conventional glass vacuum liners with their rubber top rings and a rubber stopper in the bottle.

Completely modern in design, both the pitcher and the bottle serve the purpose of keeping liquids or solid foods hot or cold for extended periods of time. Both units are manufactured by Aladdin Industries, Inc., Nashville, Tenn., from parts molded by Cambridge Molded Plastics Co., Cambridge, Ohio, and Kusan, Inc., Nashville, Tenn.

The pitcher, with its sturdily ribbed case produced in a handsome two-color combination, incorporates such consumer appealing features as a "no-drip" spout for cutting off the flow of liquid cleanly and a unique closure that prevents over-pouring and insures a steady flow. The unit is attractively designed to blend equally well with plastic, china, or ceramic tableware, either in the more formal settings of dining tables, in the dinette, or in informal settings for outdoor dining. It can be also used as an office carafe.

Either beverages or solid foods can be accommodated in the brightly colored vacuum bottle; the wide mouth permits spoons or forks to be inserted for direct eating. Like the pitcher, the case is ribbed for greater strength and added beauty.

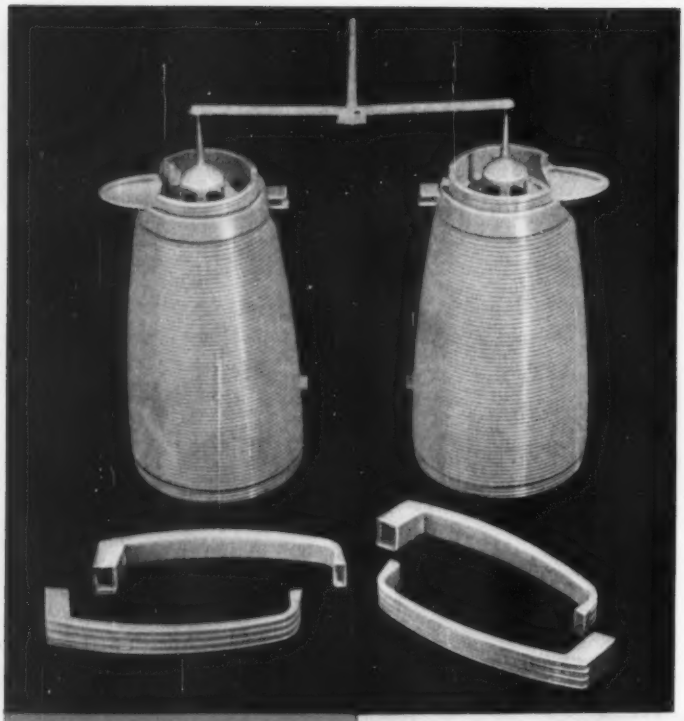
The choice of modified styrenes as the molding materials was prompted not only by the requirement for a material that will always remain comfortable to the touch despite the temperature of the contents but also by the obvious need for a material which would stand the abuse and exposure to the elements that so frequently attends the use of vacuum bottles. The styrene bodies will not rust, chip, tarnish, or peel in normal use and can easily be cleaned with ordinary warm soapy water.

Modified styrenes also have excellent dimensional stability, another factor which influenced the decision to use these materials. With so many parts of both the pitcher and the jug fitting together with molded-in screw threads, close controls must be constantly maintained in order to be sure that the threaded parts will mate perfectly and that they can be screwed together and unscrewed frequently without difficulty.

An unusual feature of both the pitcher and the bottle is the method of holding the glass vacuum filler in position which at the same time permits easy replacement of the filler in case of breakage. Conventional metal springs, which often rust, have been eliminated. Instead, the filler is held firmly in place by a regulator plug which is threaded to be screwed into a threaded hole in the base. Turning this plug in one direction forces the filler firmly against a gasket at the neck. To remove the filler, the plug is turned in the opposite direction, the base is unscrewed, and the filler taken out.

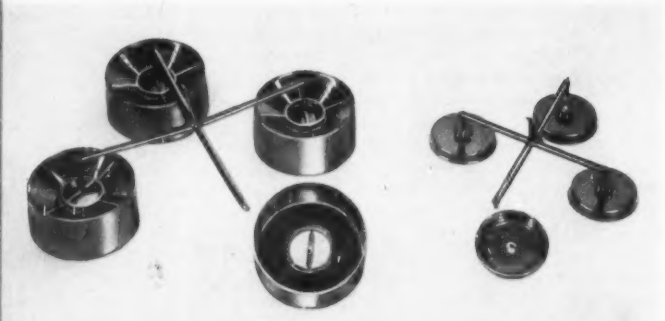
Vacuum Pitcher

The six major components of the vacuum pitcher are molded by



Body of pitcher is molded in 2-cavity mold, handles in an 8-cavity mold. Ribs in cored opening of handle permit better bonding to molded-in lugs

Float assembly consists of cover (right), with molded-in tab for positioning unit in pitcher, and base. Both are molded in 4-cavity molds. Fiberglas is inserted between pieces for insulation



Base of pitcher (left) and lid are both produced in 4-cavity dies. Screw threads on inside of cover are formed by part of mold which is removed after each shot and manually unscrewed

Cambridge, using Dow's Styron 671 formulation. Three additional parts are supplied to the manufacturer for the final assembly operation—a glass vacuum filler; the high-impact styrene regulator plug that screws into and out of the base for loosening or tightening the filler; and a rubber gasket inserted around the mouth at the top of the filler.

In molding, the six parts of the pitcher were each handled separately as follows:

1) The main body of the pitcher was molded in a two unit mold. To eliminate heavy sections and to control the thread dimensions at both top and bottom, a great deal of coring was done from the inside.

Considerable time and trouble were expended in setting up a reaming tool to be used in machining a 0.015 in. vent opening located at the back edge of the mouth of the body.

2) The handles, molded in an eight-cavity mold, have cored ends. The mold parts were so designed as to produce raised ribs within the

cored openings. These ribs permit a better bond. The openings in the ends of the handle fit snugly over lugs molded as part of the body and are cemented in place during assembly. Numerous holding fixtures are required in this cementing operation to allow the two pieces to set properly. These fixtures are mounted on a motor driven slat-type conveyor which completes a revolution every 20 minutes. With 40 fixtures in use, an assembly rate of 120 pieces per hr. is reached.

3) The base, which screws into the body, is produced in a four-cavity mold. After the parts are removed from the mold, the sprue is clipped off and the center hole is chamfered to allow for greater ease in screwing the regulator plug into the base.

4) The cover, with a molded-in baffle at one end, is also produced in a four-cavity mold. This baffle is an important part of the design of the pitcher; it permits pouring without removing the screwed-on cover. When the jug has been filled and the cover screwed in place, it is important that the baffle be correctly positioned relative to the pouring spout. This requirement presented quite a problem to Cambridge. Since the baffle and the threads of the cap are produced in one molding operation, it is necessary that the elements of the mold which produce the baffle and the threads be properly related. To solve this problem, a series of trial and error shots was undertaken until the correct positioning for both of the units had been achieved. The mold parts were then doweled in position.

The screw threads on the inside of the cover are formed by a part of the mold which is removed after each shot and which is then manually unscrewed.

5) The float closure assembly, consisting of a cover and a base, is molded in two separate four-cavity molds. After molding, the two parts are cemented together with die-cut Fiberglas inserted between for insulation.

Molded as part of the cover of the float assembly is a short stem rising from its center and a small hooked tab on the edge. This float closure is not fastened mechanically in the jug opening. After the jug is filled, the float is simply dropped into position with the tab inserted in a slot in the threaded portion of the body. The cap is then screwed into place, the stem of the float fitting into a recess in the cap. When the pitcher is tilted, the pressure of the liquid pushes the float open to permit a steady, continuous flow. When the pitcher is rightside-up, the float falls back into place and acts as a closure.

Four basic components of vacuum bottle are molded of high-impact styrene—threaded body; cover; casing bottom; and regulator plug for holding the glass filler in place

Vacuum Bottle

The wide mouth vacuum bottle is molded of Dow 475 high impact polystyrene by Kusan, Inc. The four parts produced by Kusan are the casing body; a casing bottom that screws onto the body; the regulator plug that is used in both the jug and the pitcher; and a cover that also screws onto the body and which, when removed, doubles as a handy, durable, and odorless cup for liquids. The glass filler, a rubber ring, and a tight fitting rubber stopper with a small Bakelite phenolic cap inserted in its top complete the unit.

The casing body is molded in a four-cavity mold on a 32-oz. machine. Both the casing bottom and the cup-like cover are each produced in a four-cavity mold. A double threading operation that provides the screw threads for accepting both the body and the regulator plug is used in the molding of the casing bottom.

The regulator plug is molded in a six-cavity mold, in which the threads are released when the mold opens.

The entire molding for the pitcher and for the bottle as well was a delicate and exacting job. Pin-point gating was used on all parts. Constant gaging and careful attention to the close matching of mold halves insured that the mold parting lines were practically unnoticeable in the majority of parts.

Magazine advertisements, including half-tone illustrations, are reproduced on plastic sheets for use as displays. Ad on right is blue and red; one on left is black

Photo-Decorating Plastics

HALF-tone illustrations or line drawings with fine detail can be reproduced on plastics with a photographic process recently perfected by Trans-Gel Products, Inc., Queens Village, N.Y. The process, called Permastat, has been used to make point of sale displays, signs, maps, wiring diagrams, and instrument dials for the Armed Forces.

Basic to the rather simple process is the Permastat emulsion which can be sprayed, brushed, or coated on the surface to be decorated. This emulsion is water-soluble until it has been exposed to high-intensity light. Thus the desired decoration can be printed on any plastic except polyethylene, just as a photograph is printed on sensitized paper, by placing a negative over the coated plastic, exposing it, and then washing away the unexposed portions of the emulsion.

The details of the method used will depend upon the size of the piece to be decorated, the number of colors to be applied, and the length of the production run. For long runs, it is possible to design a continuous-production conveyor-belt set-up. The illustrations on the opposite page show the pilot plant set-up for short runs at Trans-Gel. This company is not set up to handle long run jobs using its own process and prefers to sell the Permastat emulsion and make its know-how available to those who wish to use the process.

The Permastat emulsion is applied in two coats: a clear undercoat and a second coat pigmented to the color desired in the decoration. The range of colors is virtually unlimited. The Permastat emulsion can even be mixed with fluorescent pigments so that the resultant design shows up only under black light.

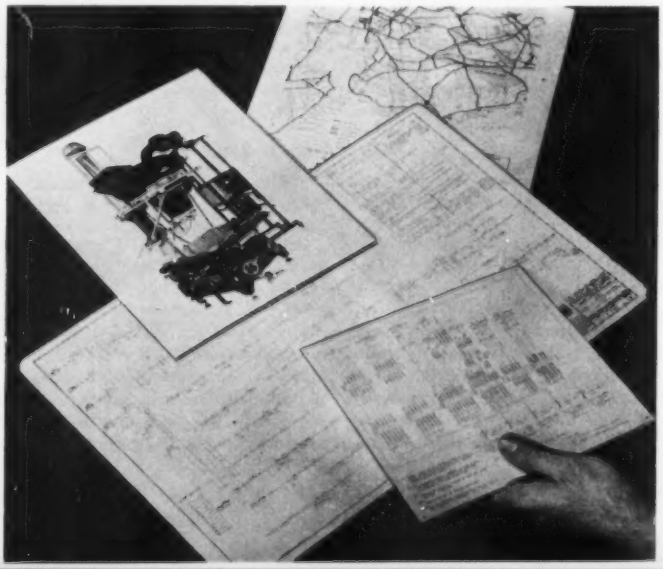
The emulsion is not affected by daylight and therefore no darkroom is needed. Furthermore, both the emulsion and the coated plastic have long shelf life and there can be a time lag between the coating step and the rest of the process.

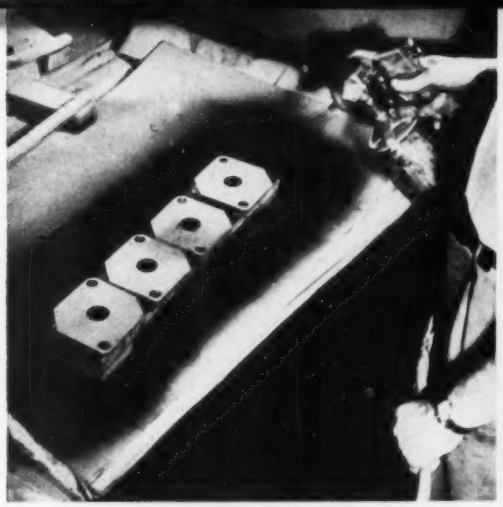
After the piece has been coated, a negative is placed over it and it is exposed to an arc light or strobe light. After exposure, the piece is washed with ordinary tap water. This removes the unexposed portions of the emulsion and the decoration remains. No developing or fixing is necessary, although a clear lacquer may be sprayed on as a protection against abrasion.

If more than one color is desired, the piece is dried after the first color has been washed and the process repeated. Registry of colors is achieved by mounting the negatives in jigs which hold the pieces in the desired position.

For the instrument dial job illustrated on the opposite page, an extra step was added to the process in order to obtain the deep black called for by government specifications. A blue emulsion is used and the pieces are dipped in black dye before the exposed emulsion is washed off.

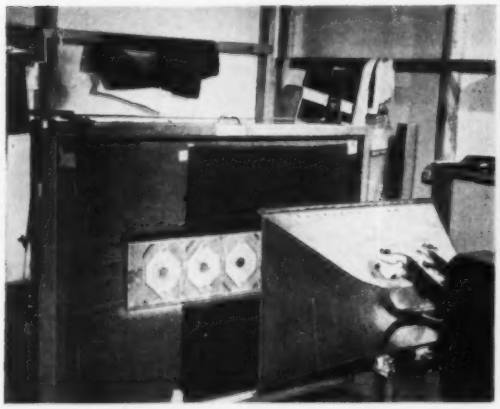
Photo-decorating process can be used to reproduce maps, wiring diagrams, charts, or photographs on any plastic sheet material with the exception of polyethylene



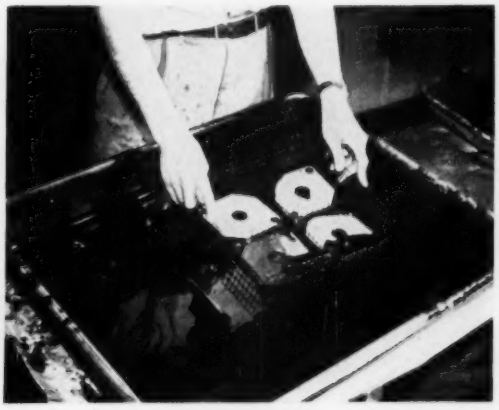


First step in decoration of instrument dials is spraying the acrylic pieces with clear emulsion. Coat of blue emulsion goes on next

Pieces sprayed with emulsion are mounted on jig which insures proper placement of negative which bears the markings desired on the dials

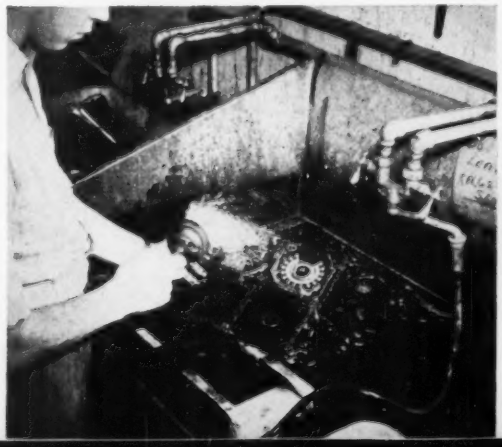


Pieces with negatives over them are exposed to arc light. Strobe light can be used on long runs to cut down the exposure time necessary



After exposure, pieces are dipped in black dye. This extra step is needed on this job to insure deep color required by the government

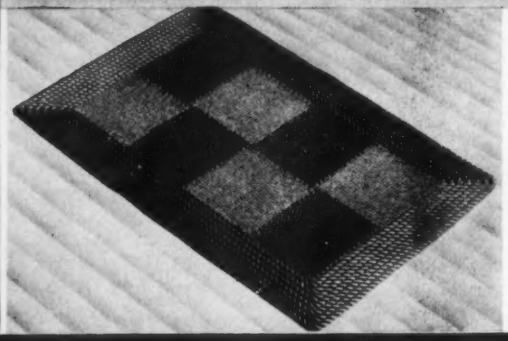
Pieces are then washed with tap water and unexposed portions of the emulsion and dye come off. Numbers and markings are unexposed



Finished pieces. No developing or fixing is necessary although pieces can be sprayed with clear lacquer after washing to resist abrasion

Roomy over-the-shoulder bag made of Vinylite plastic sheeting is designed for traveling convenience. Lightweight and durable, the 1½ lb. bag will withstand hard wear, will resist water, oils, and greases, and can easily be wiped clean. It is 15 in. long, 10 in. deep, and 5 in. wide, and is equipped with a handy open pocket. Produced by Fulton Leather Goods Co., Inc., 138 W. 25 St., New York 1.

Sturdy vinyl rug, embossed with a sisal-like finish to simulate a rope mat, protects against liquid and grit, is stainproof, acid and grease resistant, washable, and nonflammable. Measuring 2 by 3 ft., the Vinylite plastic rug can be used as a decorative mat. Available in a variety of colors, including green, yellow, red, and gray, the rug is by the Hedwin Corp., 1525 W. 41 St., Baltimore 11, Md.

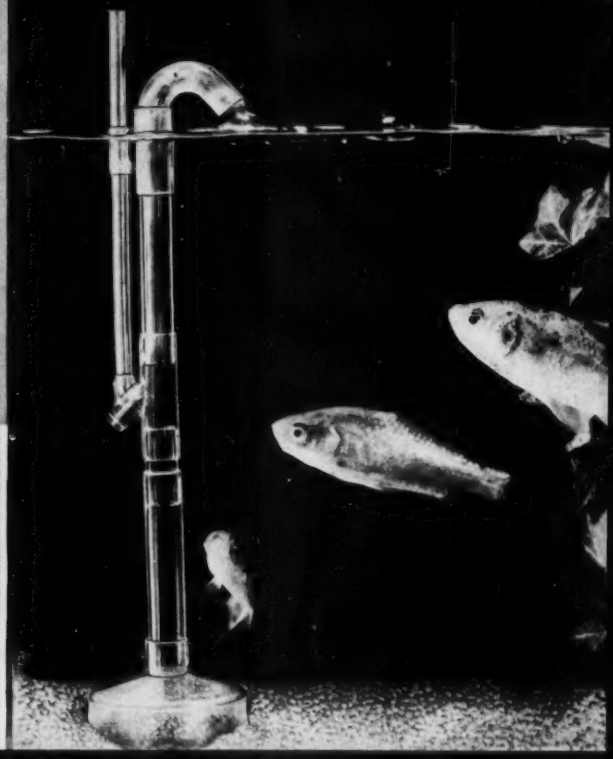


PLASTICS

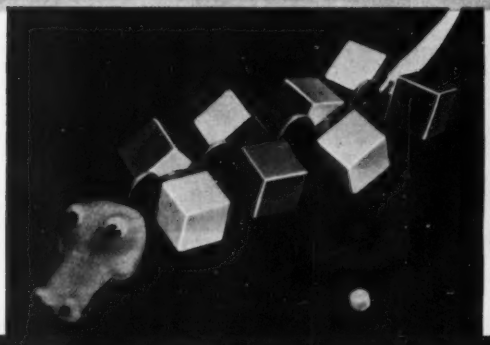
For housewives troubled by the drippings from cooking spoons, a new spoon tray provides a convenient receptacle for holding the utensils while not in use. The tray consists of two deep spoon-shaped compartments, one to accommodate soup spoons, the other for the smaller tea spoons. The brightly colored unit is molded of Lustrex styrene by the Massachusetts Plastic Corp., Ludlow, Mass.

Pick-up duster has 2 in. long brush fibers of Bakelite styrene monofilament, securely set into a colorful 12 in. handle, which are claimed to outlast ordinary bristles by as much as five to one. The tough, resilient, monofilaments do not mat, will resist moisture, greases, oils, mold, and mildew, and are easily washed clean. The manufacturer of the brush is Empire Brushes, Inc., Port Chester, N.Y.

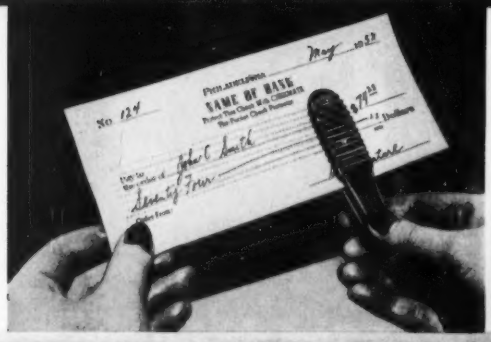
Fish and plant thrive in aquariums equipped with a filter assembled from lightweight, non-corrodible cellulose acetate butyrate Tenite II tubing and fitting. The unit eliminates sources of contamination and is adaptable to specific installations or to single or multiple tank hookups. Item is molded by Fibro Corp., 501 South Ave., Garwood, N.J., for Thor Hansen, 1396 Bryant St., Rahway, N.J.



A colorful animated action pull-toy that will delight the children is molded of non-toxic, washable styrene. Called Kasey the Klatter-Gator, the sturdy toy is equipped with the head and tail of a comic alligator. Attached to its hinged body is a series of blocks which turn, twist, clatter, and wobble as Kasey is pulled along. The unit is molded by Kusan, Inc., 2716 Franklin Rd., Nashville, Tenn.



PRODUCTS



To prevent check tampering, a clever styrene protector can be used to instantly perforate a check and thus make it impossible to alter the amounts, payee's name, and payor's signature. The sturdy, bank-approved unit measures 3¾ in. long by 1 in. wide, is small enough to be carried in the pocket. The manufacturer of the protector is Postamatic Co., 1549 Belfield Ave., Philadelphia 41, Pa.

Sturdiness and durability of high-impact styrene coupled with its shatter-proof, rust-proof heat-resistant, and washable qualities lend versatility to a multi-purpose bucket suitable for a variety of household uses. Called the Kitchen Kaddie, the unit, with its styrene lid, can be used as a scrap container, cannister, etc. It is produced by the Tri-State Plastic Molding Co., Henderson, Ky.

PLASTICS *Merchandising*

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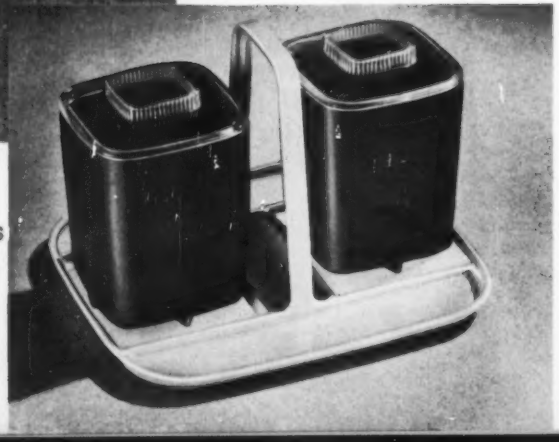

1 **Ice cream scoop**—Embodying the principle and the style of the traditional ice cream scoop, this bright red styrene model utilizes an efficient, yet simple, aluminum ejector. Retails for 39¢.

Frank Paper Products Corp., 2941 E. Warren Ave., Detroit 7, Mich.

2 **Scraper**—High-impact polystyrene plate and bowl scraper is both pliable enough to work on curved surfaces and tough enough to scrape away burned food particles. The easily gripped styrene handle, with a beveled tip for removing the larger particles, is molded well into the blade for greater strength.

Federal Tool Corp., 3600 W. Pratt Blvd., Chicago 45, Ill.

3 **Decals**—Halloween witches, goblins, and pumpkins enliven a series of vinyl decorations designed especially for the Fall season. Made from Geon vinyl resin, the washable, permanent Applical cutouts attach to any smooth polished surface merely by fingertip pressure.

Educational Products Co., Andover, N. J.

4 **Sun shade**—Uncomfortable glare and bothersome nose sunburns are prevented with this practical Tenite II cellulose acetate butyrate eye shade. Hinged earpieces hold the durable shade in place.

P. H. Houston Co., Box 1413, Fairmont, W. Va.

5 **Beauty kit**—Women's grooming essentials can be conveniently carried in a heat-sealed 20-gage white vinyl travelling kit. Items include liquid cleaner and foundation, both in squeezable polyethylene bottles with urea closures and powder and rouge packaged in styrene containers.

Harriet Hubbard Ayer, 390 Park Ave., New York 22, N. Y.

* Reg. U. S. Pat. Office

6 **Canister set**—A matching styrene handle tray with two individual compartments accomodates two midget size styrene canisters. The set, called "Serve n' Store," offers a wide variety of possible kitchen and outdoor picnic uses. It is available in burgundy, chartreuse, gray, and green.

Victory Mfg. Co., 1722 West Arcade Place, Chicago 12, Ill.

7 **Placque**—Combining patriotism with attractive decor, a metallic-colored styrene wall placque embodies the coat of arms of the United States with the perennial "good luck" horseshoe. Retails for 25¢.

National Plastic Products Co., P.O. Box 3647, Highland Park, Mich.

8 **Window shades**—Hand-painted vinyl window shades are patterned in individual styles for every room in the house. The washable shades are water-proof, flame-proof, insect-proof, and color-fast. They retail for $2.98.

Clopay Corp., Clopay Square, Cincinnati, Ohio.

9 **Airplane models**—Small scale airplane models, suitable for use by manufacturers as either an exhibit or desk-top display, are molded of Tenite II cellulose acetate butyrate. The models, complete with insignia and special markings, are mounted on pedestals in positions of actual flight.

Topping Models, 106 North Main St., Akron 8, Ohio

10 **Auto toy**—The styrene model "fix-it" convertible provides all the spare parts, including bumper jack and wrench, to enable child to disassemble the working parts of the auto. Vinyl wheels and metal hub caps can also be removed and a spare tire put on.

Ideal Toy Corp., 200 Fifth Ave., New York 10, N. Y.

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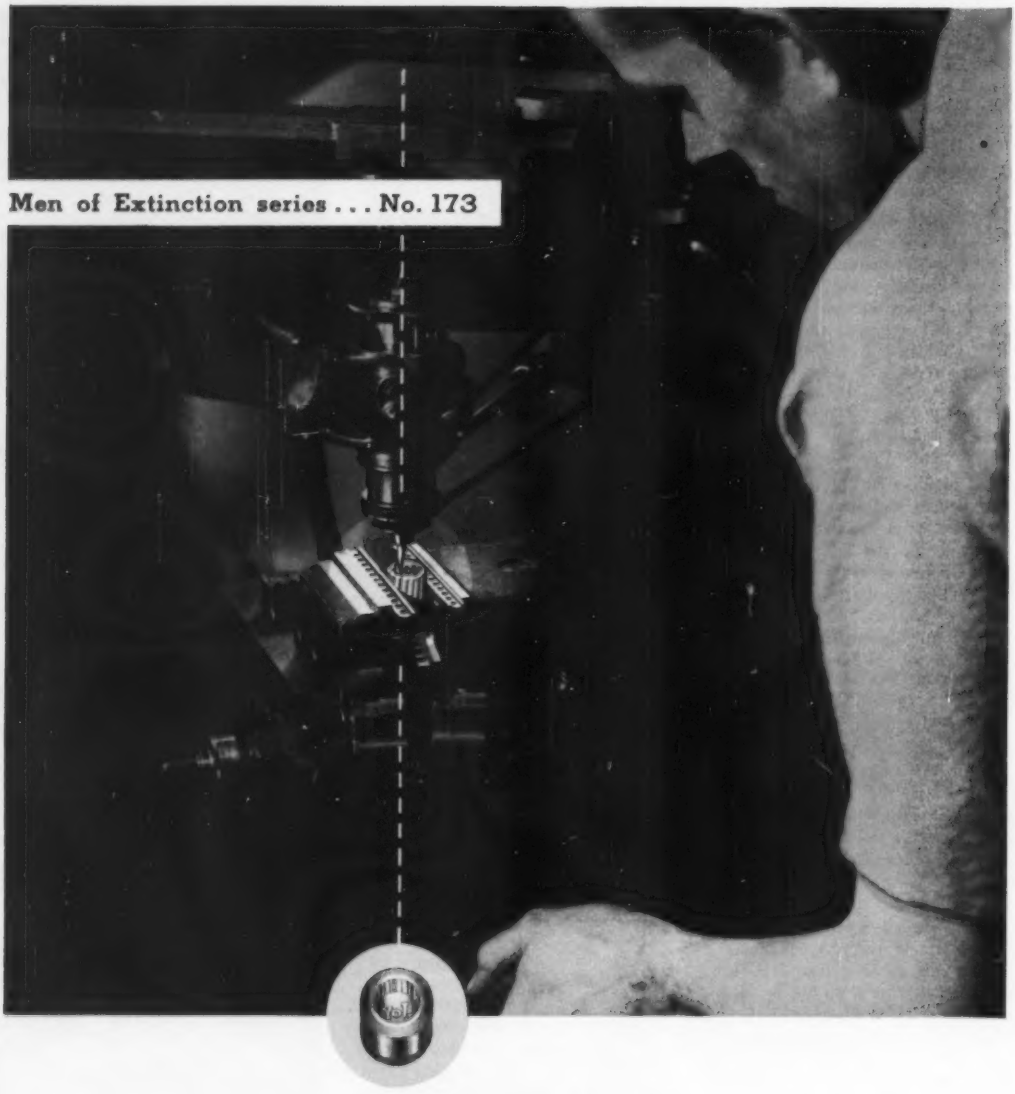


Nickodemus is one of a number of capable people whom we meet when prowling around the premises at MD&E. It is people like Nick who have a hand in making Hobbed Cavities by Midland. He qualifies as a man of extinction because he wants to monkey around triple-checking, thousandths, tens of thousandths, angles, contours, depths, etc. We're busy, and don't have time, but Nickodemus insists. We can't let him go because he owns the micrometer. Such is the situation at MD&E. Wherever sophisticated molders gather, the name Midland comes up when Hobbed Cavities are mentioned. Midland Hobbed Cavities, as you know, are proving every day that two things *are* alike . . . even 16 things . . . even 32 things, plastics units that is. If molding big or small plastics units in uniform multiple quantities, is your business, write Midland Die & Engraving Co., 1800 W. Berenice Ave., Chicago 13. Midland also makes plastics molds, die-cast molds, engraved dies, steel stamps, pantograph engravings.

High Vacuum Metallizing

by A. H. HARTMAN†

IN THE high vacuum metal evaporation process to produce metallic finishes on plastics, three major steps must be considered: a) Producing a suitable undercoat upon which the metal is to be deposited by dipping in lacquer and baking; b) producing the film by metal evaporation in a high vacuum; c) providing a protective coating of baked lacquer over the metal film.

A typical set-up for a complete production system for high vacuum metallization of plastic items is shown in Fig. 1. Special attention has been given to minimizing the handling of parts, which is usually a major cost element in the metallization process. About 3300 sq. ft. of space is required for the set-up. Throughout the operation, work is carried on riser rods, which are lengths of square steel stock with slots milled on two opposite sides. Spring clips positioned in these slots hold individual pieces of work.

The piece to be metallized is attached to the riser rod in such a position as to eliminate any possibility of accumulation of lacquers in reverse-curve horizontal sections during either of the lacquer dipping operations.

Riser rod carrying trucks, shown in Fig. 2, are used to carry the rods, both loaded and empty, at different stages of the operation. Figure 3 shows an operator loading the riser rods from a truck onto the chain conveyor which will carry the work into and out of the lacquer bath at a predetermined fixed speed. Special attachments provide an additional quality control feature by permitting variation of the angle of extraction of the work from the lacquer bath. The pieces can be dipped without resultant flow marks and tears when these variables are properly related.

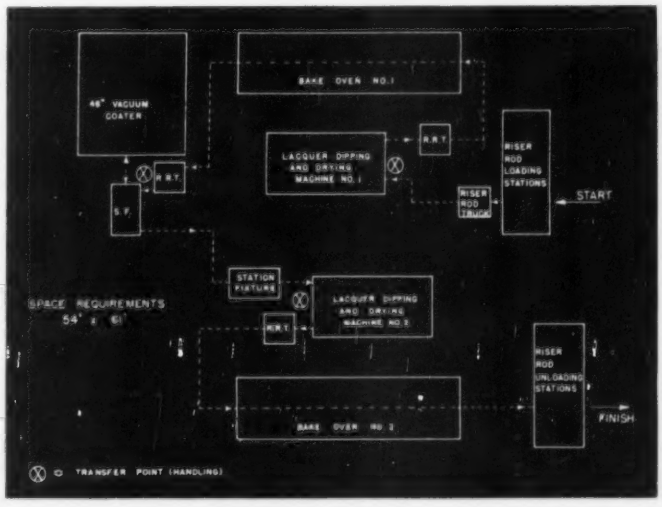
From the undercoat bath, the chain conveyor carries the work into an oven tunnel (Fig. 4) which is part of the dipping machine. Here a preliminary drying of the coating to a tack-free state is effected by the use of controlled-temperature hot air drafts, in order that subsequent operations may be continued without regard to atmospheric conditions of humidity, unusual dust content, etc.

Undercoat Baked

The conveyor then returns the load of riser rods to the loading point, where they are again transferred to a riser rod truck. The operator moves the truck by hand into the baking oven, Fig. 5, where drying and setting of the undercoat lacquer is completed. Carefully controlled temperatures and air circulation are made possible in this oven by the use of standard temperature recorder-controllers and high capacity fans which recirculate the air through a special heat transfer chamber. Internal ducting supplies high velocity air to all areas of the oven.

This setting of the undercoat in the high vacuum process must meet higher-than-normal standards. Volatiles which may not be evident by examination under atmospheric conditions may come off under subsequent high vacuum stresses and adversely affect the deposition of the metal. Retention of volatiles in the undercoat may also interfere with the later topcoat application, resulting in an apparent attack by the topcoat on the undercoat, and a pitted surface.

Fig. 1—Dotted lines trace course of plastic pieces through the various steps of the high vacuum metallization process, including two lacquering and baking steps



* Reg. U. S. Pat. Office
† Distillation Products Industries Div. of Eastman Kodak Co., Rochester, N.Y.

All illustrations courtesy Distillation Products Industries Div. of Eastman Kodak Co.

Fig. 2—Specially designed trucks facilitate handling of riser rods during different metallization steps

Fig. 3—At lacquering unit, riser rods are transferred from truck to a chain conveyor which carries the work through the bath and into an oven tunnel (see Fig. 4)

Minimum drying time and baking temperature for each coating material should be established.

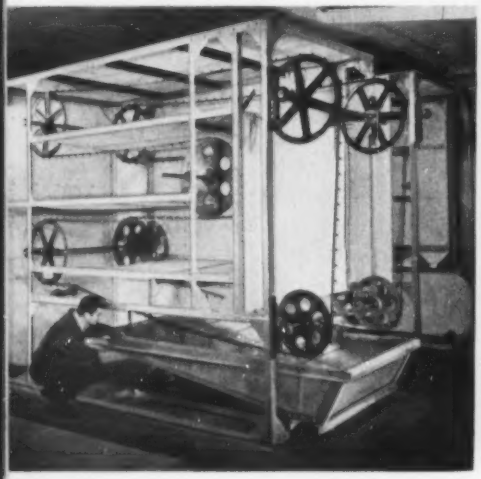
After the undercoat is baked, the riser rods are transferred from the trucks to station holding fixtures. Each station holding fixture consists of from six to nine stations. These may each carry up to 12 riser rods, which are rotated by sprockets and a chain drive so as to expose all sides of the objects on the riser rods to the evaporation source assembly, Fig. 6. This assembly is at the center of the station holding fixture. High amperage passed through the filaments of the assembly volatilizes the metal attached to the filaments.

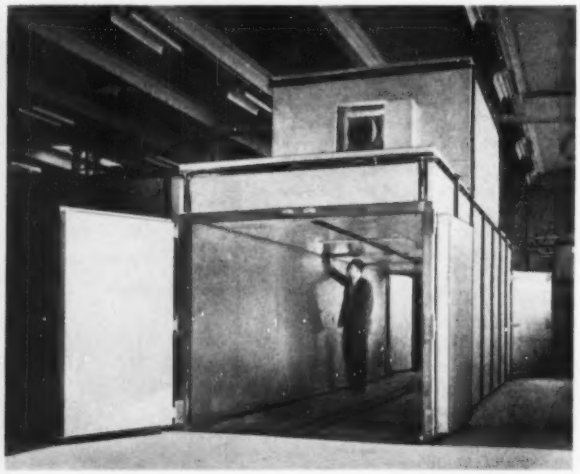
High Vacuum Produced

When the station holding fixture is slid into the vacuum chamber on a guide track—Fig. 7—a drive pulley shaft on the fixture engages a clutch on a shaft coming through the far end of the chamber wall, and the evaporation source assembly is connected to electrical terminals in the chamber. When the door of the chamber is closed, the pumping cycle is started, and metal evaporation commences when the pressure reaches 1/1,400,000 of an atmosphere. The fixture is rotated prior to and during evaporation and continues for a short interval afterwards, before air is let into the chamber and the door opened for the removal of the

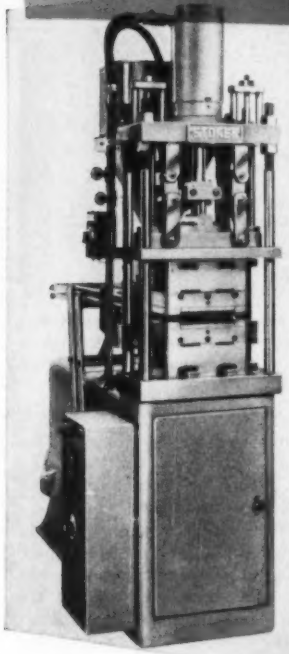
Fig. 4—Side view of lacquering unit, with dip tank at bottom and an oven tunnel for preliminary drying in the section above

Fig. 5—During actual operation of metallization process, riser rods loaded on the special trucks are moved into this oven for final baking





New Fully Automatic Press molds all Thermosets



Recently introduced to the plastics industry is a new Stokes 15-ton plastics molding press which embodies revolutionary developments in design and operation. Completely adaptable to all types of thermosetting compounds, including alkyds without modification, Model #800 makes a wide variety of simple and complex parts, such as knobs, appliance parts, tube sockets and plugs.

Among the many features offered by the new press are:

EXCEPTIONAL SPEED — A full molding cycle of five seconds, plus cure-time

IDEAL MOLDING ACTION — Fast in closing, slow in pressing

UNLIMITED CAVITIES — Number depends only on mold dimensions, size of piece, press capacity

SHUTTLE-TYPE FEED — All powder measured and placed accurately in each cavity

FULLY POSITIVE EJECTION — Cam actuates the knockout pins, top and bottom

PROTECTIVE DEVICES — Stop the press in event of irregularity in cycle

RAPID MOLD CHANGE-OVER — Molds from earlier 15-ton automatics are fully adaptable to the new press

SEQUENCE-OPERATED — Each step automatically actuated

Model #800 represents the latest achievement in the design and manufacture of plastics molding presses by Stokes, which has been actively engaged in serving the plastics molding industry for the past fifty years.

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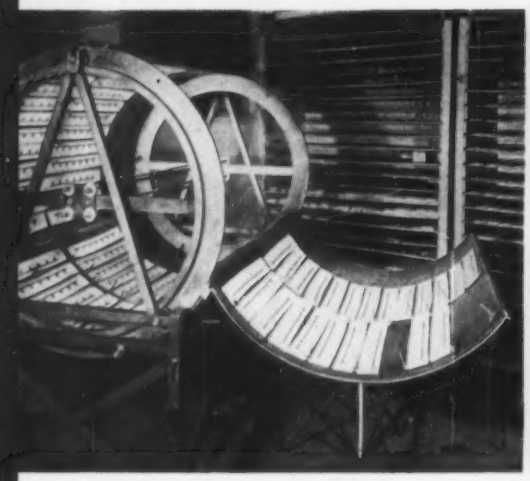

Fig. 6—The evaporation source assembly, located at the center of the station holding fixture, consists of filaments and attached metal

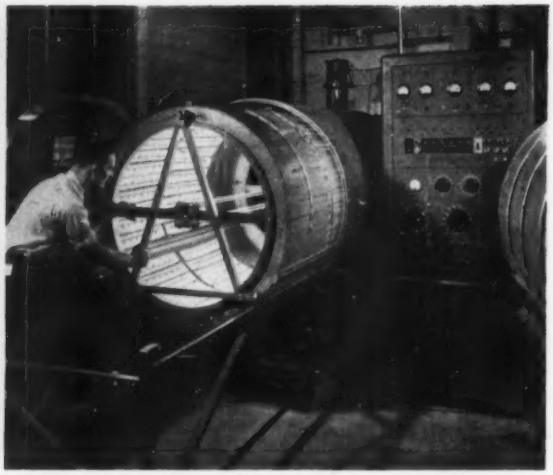

Fig. 7—Station holding fixture, ready for the metallization process, is placed on a guide track and slid into the chamber

station holding fixture and its load of metallized plastics objects.

The riser rods are now once more loaded onto a chain conveyor, and a second lacquer coating, the protective topcoat, is applied by dipping. Final baking then takes place, after which the metallized parts are removed and the stripped riser rods are returned to the assembly table. The sequence of operations is then repeated.

Production rate for a system such as described above naturally depends on the dimensions and shape of the objects being coated. A toy gun (Figs. 8 and 9) of which 110 can be metallized per load, can be run on a 15 min. cycle or at a rate of 440 pieces an hour. A small airplane, approximately 4 in. long with a 4 in. wingspread, can be turned out at a rate of 1250 per hour. A toy chicken measuring approximately 1½ in. high by 1½ in. wide, can be processed at a rate of 5300 per hour.

These figures and the accompanying illustrations give a concrete idea of the possibilities of and the equipment needed for vacuum metallizing of plastics parts. With the set-up described, an integrated production process is possible which will turn out pieces at low per-unit cost and with a minimum of handling; the small amount of handling required can be done by low-cost unskilled labor after going through a minimum training period.

Fig. 8—Toy plastic guns, attached to riser rods, have been undercoated. Rods are being placed in station holding fixture ready for vacuum chamber. (See also Fig. 7)

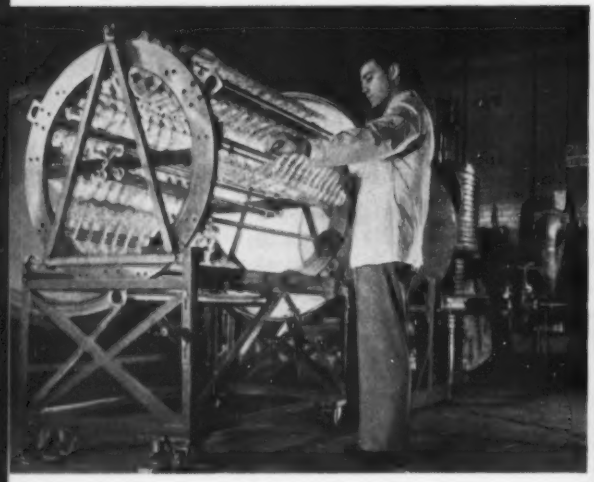

Fig. 9—Toy guns can be metallized at a rate of 110 per load on 15 min. cycle, or 440 pieces an hour

Automatic Machining of Laminates

MANY high pressure laminates are not molded into their final form, but are basic materials from which end products are machined. Produced in the form of sheets, rods, and tubes, these basic engineering materials lend themselves excellently to practically any normal machining operation.

The Synthane Corp., Oaks, Pa., is not only a leading producer of laminates, but also makes a specialty of fabricating their laminates into finished products. In their fabricating setup, they have what is known as an "automatic machine room" division under the direction of I. L. Straub. Some four years ago, Mr. Straub became interested in the use of air-powered equipment as a component in machine design and in machine change-over, and has developed many ingenious applications of air power to standard finishing equipment. As a result of this work, well over 100 of the company's machines are today equipped with "controlled-air-power" devices, the heart of each one of which is a Bellows Air Motor and Hydro-Check (Fig. 1) which can act as an automatic timer in limiting and actuating as many as 15 operational movements in sequence.

Simple Principle

The principle of using the air motor and hydro-check as an automatic timer is quite simple, though the ultimate wiring circuits appear quite complicated. An example of such a circuit is shown in Fig. 2. The advancing stroke of the air motor piston contacts and actuates any required number of Micro-switches spaced along a slotted guide at various distances, depending upon the time elements involved.

Additional time control factors may be further exercised through built-in controls in the air motor and hydro-check. Occasionally, if a machine has stood idle for some time, it may be necessary to have a few minutes of "dry run" cycling until the viscosity of the oil in the hydro-check reaches a normal operating level; from then on the timing is constant throughout the machining run.

The rate of travel of the air motor piston is always under precise control, first by a separate air pressure regulator, second by the built-in speed controls in the Electroaire valve, and third by the controlled resistance of the hydro-check.

A typical production job at Synthane (Fig. 3) which has been standard for some years requires that a radius be cut on the outside edge of a 3½ in. diameter laminated textile bobbin head, a center hole of 1¼ in. diameter be cut, and that the edge of this hole beveled. Previously, three lathes with three operators were required to keep up production. Now one operator on one lathe which has been converted to automatic operation produces 75% more parts per hour. Fig. 4 shows the automatic set-up for this job. In the operational sequence a blank disk is first placed on a pilot head on the head stock and held in place by the tail stock. The operator then pushes the start switch which energizes the advance side of the Electroaire valve on the BEM1-120 Air Motor used as the automatic timing and control unit. As the air motor advances, a one-way dog on the piston rod trips the first Micro-switch, energizing the advance side of the Electroaire valve on the first of the two BEM5-25 Air Motors used to power the movement of the cross slide. The cross slide advances, its feeding rate controlled by the Hydro-Check, cutting the radius on the edge of the bobbin head.

(*Continued on p. 122*)

FIG. 1

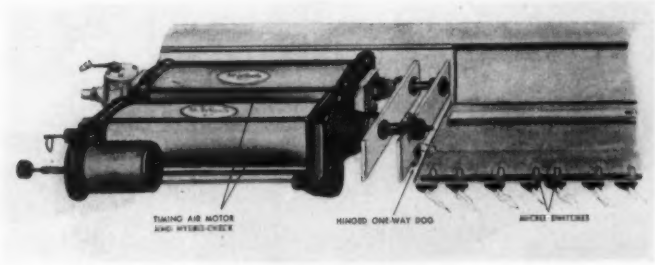

FIG. 2

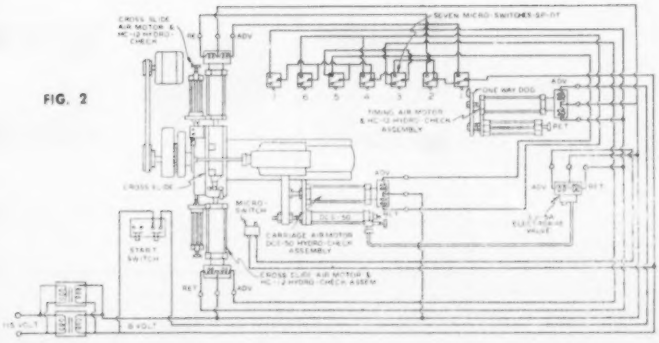

FIG. 3


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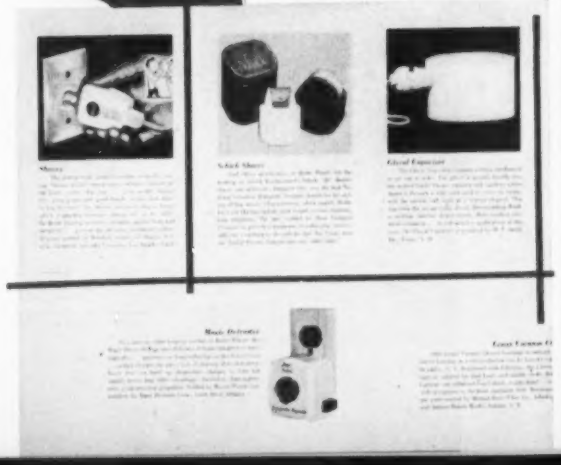

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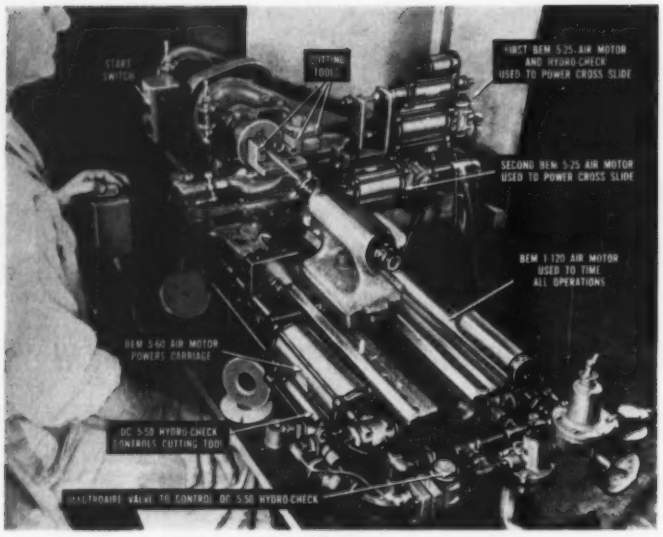


FIG. 4

As this operation is completed, the timing air motor which has continued to move forward, trips the second Micro-switch, which energizes the retract solenoid on the Electroaire valve of the first BEM5-25 Air Motor, causing the cross slide to retract to its original position.

The timing air motor continues to advance, tripping a third Micro-switch which energizes the advance side of the Electroaire valve on the BEM5-60 Air Motor used to power the lathe carriage. The carriage advances rapidly until it trips another Micro-switch mounted on the lathe bed, which energizes the Electroaire valve used to control the DCS-50 Hydro-Check. The DCS-50 Hydro-Check controls the feeding rate of the cutting tool used to cut the bevel on the edge of the center hole. As proper depth of the bevel cut is reached, a positive stop holds the carriage, until the timing air motor trips still another Micro-switch, causing the carriage to retract quickly.

The timing air motor then trips a sixth Micro-switch, energizing the advance side of the Electroaire valve on the second of the two BEM5-25 Air Motors used to power the cross slide, moving the parting tool into proper position. At the same time the sixth Micro-switch again energizes the advance side of the Electroaire valve on the BEM5-60 Air Motor on the lathe carriage. The carriage advances quickly until again checked by the DCS-50 Hydro-Check which controls the feeding of the parting tool.

The timing air motor continues to advance, tripping the seventh Micro-switch to return the carriage, and the eighth Micro-switch to restore the cross slide to its original position and to retract the timing air motor, ready for a new cycle.

Production Milling

Another large production machining operation involved the milling of a slot in the head of a textile bobbin. Figures 5 and 6 illustrate the automatic setup which was devised for this job. The procedure involves manual clamping of the textile bobbin head in position by a hand clamp, after which the operator presses the start button. This energizes the advance side of the Electroaire valve of the BEM1-120 Air Motor used to time all operations. The air motor advances, tripping

FIG. 5

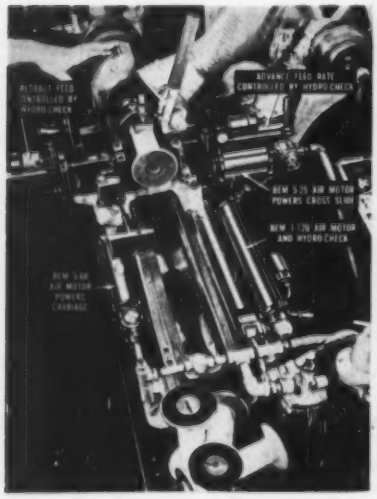
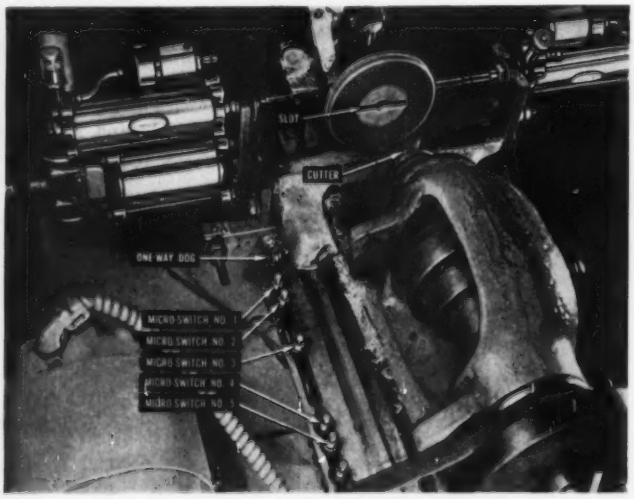


FIG. 6



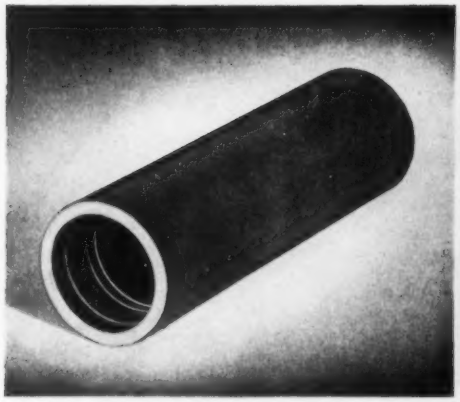


FIG. 7

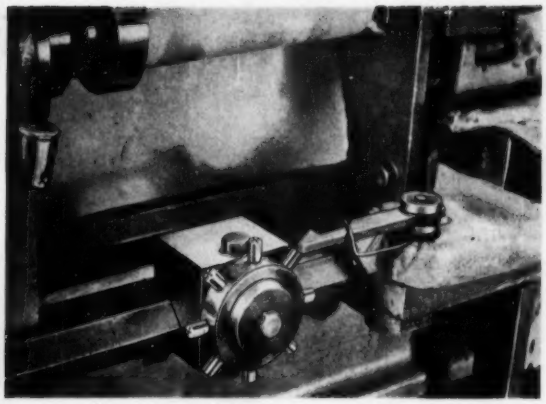


FIG. 8

Micro-switch No. 1, energizing the advance side of the BEM5-25 air motor used to power the cross slide. The cross slide advances. Almost simultaneously the timing air motor trips Micro-switch No. 2, energizing the advance side of the BEM5-60 Air Motor powering the carriage. The carriage brings the part up quickly to the end cutter at the center hole of the bobbin. The cross slide continues to advance, feeding the part to the cutter under close control of the Hydro-Check, milling one half of the slot.

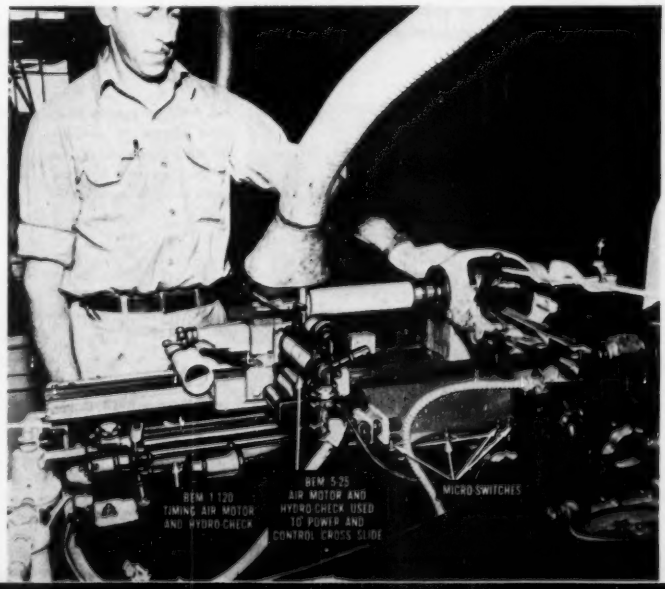
The timing air motor then continues to advance, tripping Micro-switch No. 3 energizing the retract side of the BEM-25 Air Motor, reversing the cross slide and milling the other half of the slot. The reverse feeding rate is controlled by a second Hydro-Check mounted on the opposite side of the cross slide. The timing air motor trips Micro-switch No. 4, reversing the carriage, and Micro-switch No. 5 which reverses the timing air motor BEM1-120. The unit is then ready for the next cycle.

A third production job required that a counter-bore and a recess be cut into a textile bobbin barrel. Figure 7 illustrates the several diameter counter-bores required, and also the depth of cut for each counter-bore. Figure 8 shows the positive stop which controls the depths of the counter-bores. There are eight stops, four of one length and four slightly shorter, arranged alternately and changing with each movement of the carriage. Figure 9 shows an over-all view of the automatic set-up, which requires that the operator manually place the tube in position. He then pushes the start button, energizing the advance side of the Electroaire valve on the BEM1-120 Air Motor used to time and control all operations. The air motor advances, tripping the first Micro-switch which energizes the BEM5-25 Air Motor used to power the carriage. The carriage advances for the boring operation, feeding rate controlled by a Hydro-Check. Depth is held by the positive stop shown in Fig. 8.

The timing air motor continues to advance, tripping the second Micro-switch which energizes the advance side of the BEM5-90 Air Motor used to power the cross slide. The cross slide advances, cutting the two grooves and beveling the inside edge. Feeding rate is closely controlled by the Hydro-Check. As this operation is completed, the advancing timing air motor trips the third Micro-switch, reversing the cross slide, the fourth Micro-switch, reversing the carriage, and the fifth Micro-switch, which reverses the timing air motor. The part is removed, turned around, and locked into position ready for a duplicate operation on the other end. Production was virtually doubled, and with an unskilled operator.

These three examples indicate some of the infinite possibilities for the further development of "automatic machine rooms" for many fabricating operations.

FIG. 9



New Pipe Extrusion Equipment

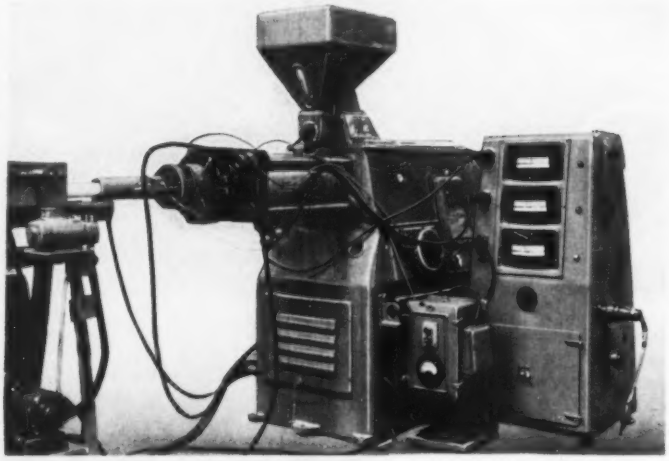


Fig. 1—Rigid vinyl pipe from twin-screw extruder is fed through special die into water-cooled forming tube. Air pressure expands pipe till it contacts tube; chilling of skin is sufficient to prevent pipe's collapse

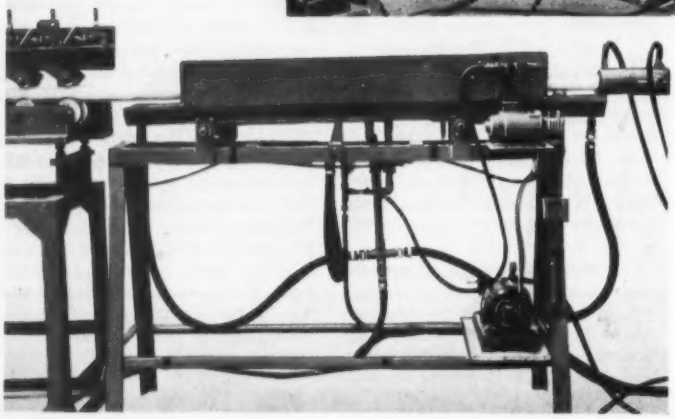


Fig. 2—For final cooling of extruded vinyl pipe, it is passed through a water filled cooling tank which is equipped with flexible rubber baffles or seals at each end

A COMPLETE package of equipment is now available for the production of rigid vinyl pipe or tubing in varying diameters and in any reasonable length up to 50 ft. or more if required. This package, developed and engineered by R. H. Windsor Ltd., London, England, consists of a twin-screw extruder, a yoke-type tubing die, a water-cooled forming tube, a water cooling tank, a motor-driven roller-type pulling device, and a suitable conveyor and specialized type of cut-off equipment. The package is marketed in the U. S. by F. J. Stokes Machine Co., Philadelphia, Pa.

The extruder feeds rigid unplas-

(*Continued on page* 194)

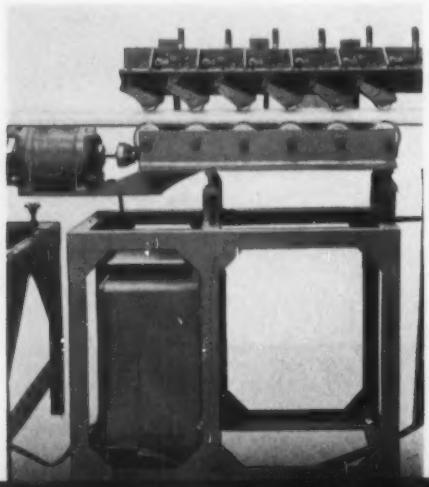


Fig. 3—From cooling tank, pipe passes to positive pulling device with six rollers driven by the same variable speed motor

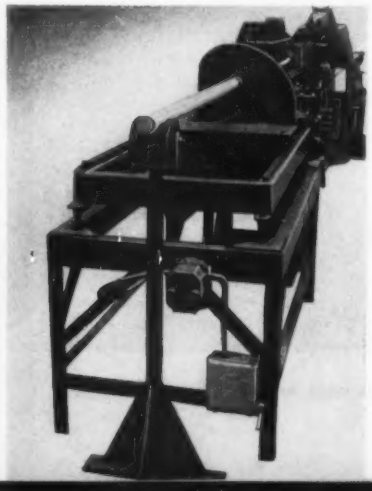


Fig. 4—Cut-off machine consists of belt-driven circular saw and suitable guard; plug at the end of pipe is inserted to hold in the air pressure

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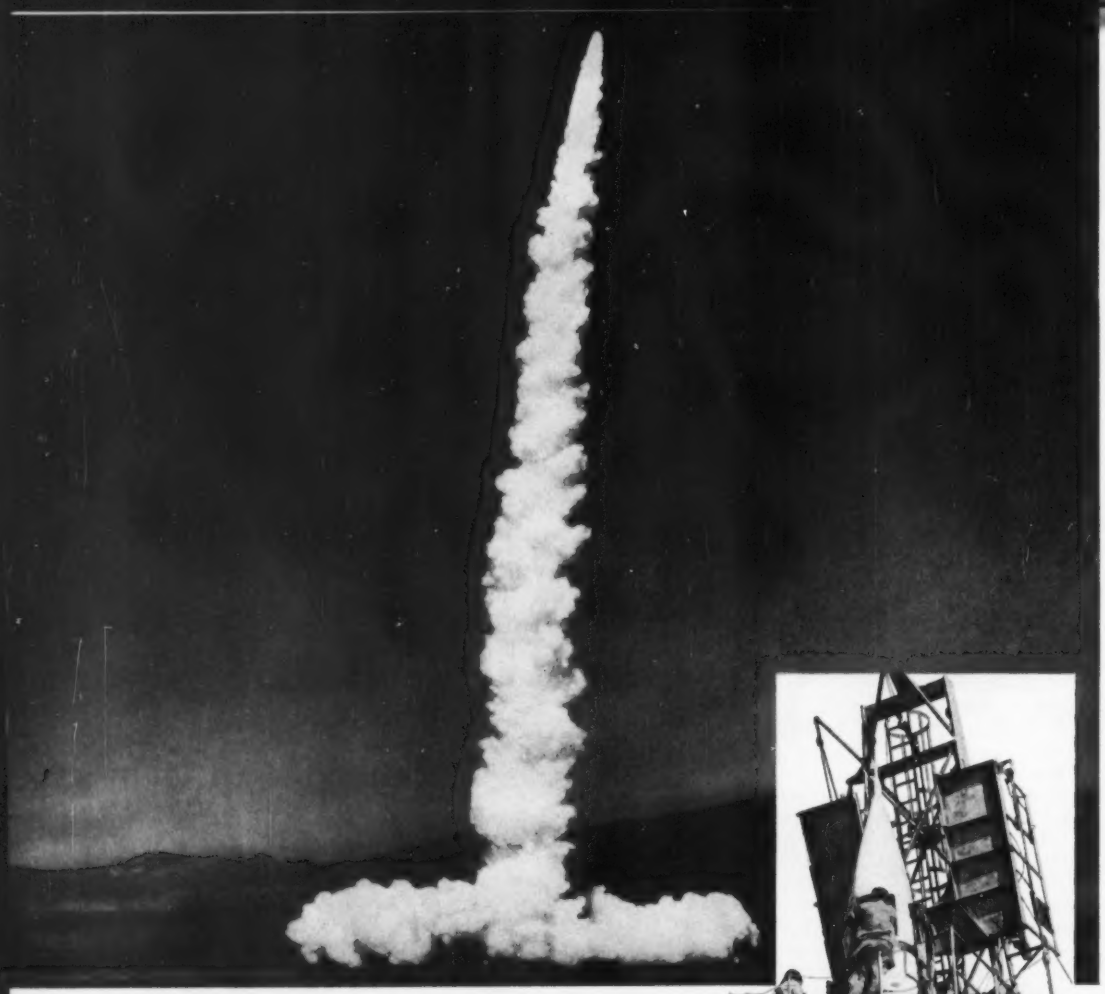

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Furfuryl Alcohol as a Resin Former

by E. A. REINECK†

The most important industrial reaction of furfuryl alcohol is resinification in the presence of acid to produce dark thermosetting resins. Although the mechanism of the resinification is complex and not fully understood, the initial reaction of acidified furfuryl alcohol results in formation of a dimer by intermolecular dehydration. Usually furfuryl alcohol is partially resinified by means of an acidic catalyst to form fluid and soluble resins. Resinification is halted and a storage-stable polymer is obtained by neutralizing the resin. Neutral resin is advanced to the infusible state by re-catalyzing with acid at the time of use. Cured furfuryl alcohol resin is one of the lowest cost, heat-stable polymers inert to the corrosive and dissolving action of strong alkalies, acids, and organic liquids.

THE cost of corrosion in the United States is reported to be over 5½ billion dollars annually.[1] Much of this economic and material loss cannot be prevented, but the application of carefully engineered materials of construction can go far in reducing the cost. Even a 1% saving amounts to 55 million dollars annually, or thousands of tons of critical metals and other material. There is good reason to believe that corrosion-resistant construction of the past 11 years based on furfuryl alcohol resin and the proper choice of reinforcing materials has been an important factor in helping to lower the cost of corrosion.

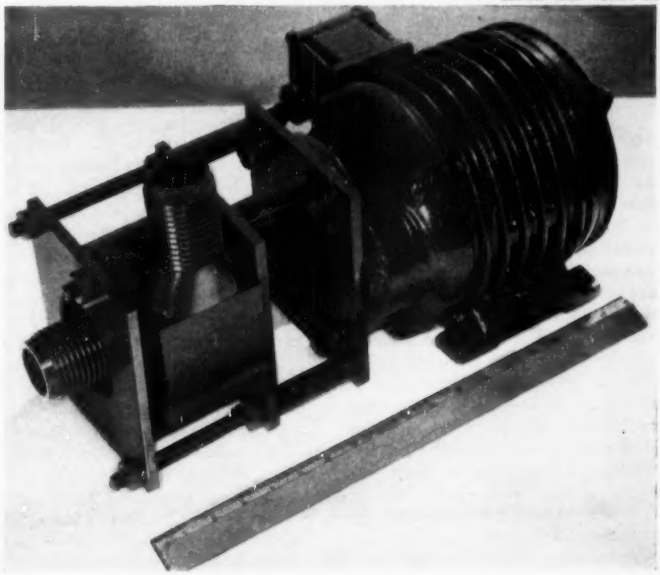
Most industrial applications of furfuryl alcohol resin are based on its ability to cure to infusibility with acid catalysts, and its subsequent inertness in the cured state to corrosive chemicals. Its important applications are primarily in the field of corrosion-resistant construction where steel, alloys, lead, concrete, and other ordinary materials of construction either disintegrate rapidly or are entirely unsuitable. It serves as a binder in resinous cements, in asbestos-filled cast parts, and in glass-cloth reinforced molded laminates. Also of consequence are uses for the polymer in the impregnation of porous substances, as a binder for porous glass fiber mats, as an additive in asphaltic battery case manufacture, as a binder in low-temperature curing adhesives.

Resinous Cements

Corrosion-resistant resinous cements are prepared by mixing an inert filler such as carbon or silica containing an acid catalyst with a liquid resin which is catalyzed by the acidity to the solid and infusible state. There are two main types of resin cements—namely, those based on furfuryl alcohol resin and those based on phenol-aldehyde resin. The phenolic cement is resistant to most acids, including mildly oxidizing acids, to mild non-caustic alkali solutions, and to many organic liquids; heat resistance is good (360° F.), porosity is low, and strength is high. The furfuryl alcohol resinous cements have approximately the same handling and physical properties as phenol-based materials, but the chemical resistance is different. They are used extensively because they withstand the attack of alkalies of all concentrations—even hot solutions of concentrated sodium or potassium hy-

Chemical-handling pump molded from acid-catalyzed furfuryl alcohol resin

Courtesy Nukem Products Co.



* Reg. U. S. Patent Off.
† Quaker Oats Co., Chemicals Dept.
[1] Chem. Eng. News, 27, 2764 (1949).

Table I—Physical Properties and Chemical Resistance of Carbon-Filled Resinous Cements

	Furfuryl-alcohol resin base	*Phenolic resin base*
Working time[a] at:		
60° F., min.	90	180
70° F., min.	60	60
80° F., min.	30	30
Hardening time[b] at:		
60° F., hr.	48	72
70° F., hr.	20	24
80° F., hr.	12	15
Tensile strength, p.s.i.	1,500	1,100
Compressive strength, p.s.i.	12,000	11,000
Flexural strength, p.s.i.	1,500	1,100
Adhesion to wire-cut acid brick, p.s.i.	500-750	600
Maximum recommended service temp., °F.	300-380	360
Coefficient of expansion, 10^{-6} per °F.	6-18	6.4
Density, lb./cu. ft.	90-95	90
Water absorption, %	0.5	0.75
Shrinkage on setting	Nil	Very slight
Resistance[c] to corrosives at 150° F.		
40% sodium hydroxide	E	P
25% sulfuric acid	E	E
60% sulfuric acid	G	VG
35% hydrochloric acid	E	E
60% phosphoric acid	E	E
Hydrofluoric acid	E	E
5% nitric acid	F-G	F-G
5% chromic acid	F	F
5% sodium hypochlorite	F	F
50% acetic acid	E	E
Aliphatic hydrocarbons	E	E
Aromatic hydrocarbons	E	E
Chlorinated solvents	E	E
Esters	E	E
Alcohols	E	E
Ketones	E	E
Mineral oils	E	E
Vegetable oils	E	E
Alkalies	E	P-F
Food acids	E	E
Soap and cleansers	EE	F

[a] Time that resinous mortar remains in trowelable condition.
[b] Time required for cement to harden thoroughly.
[c] Code for resistance: E—Excellent; VG—Very good; G—Good; F—Fair; P—Poor.

droxide. The resistance to acids and organic liquids is similar to that of phenolic cements, except that the latter excel in resistance to mildly oxidizing acids. Other points in favor of furfuryl alcohol cements as compared with phenolics are the long storage stability of the liquid resin without change in viscosity, and the lack of adverse physiological effect on users.

Relative to chemical resistance of mixtures of the chemicals listed in Table I or resistance to other chemicals and conditions, it is advisable to consult with the manufacturers of such cements for specific recommendations. The following are suppliers of furfuryl alcohol type resin cements: Atlas Mineral Products Co., Mertztown, Pa.; Ceilcote Co., Cleveland, Ohio; Electrochemical Supply and Engineering Co., Emmaus, Pa.; Furane Plastics, Inc., Glendale, Calif.; Haveg Corp., Newark, Del.; Maurice A. Knight Co., Akron, Ohio; Nukem Products Corp., Buffalo, N. Y.; Pennsylvania Salt Mfg. Co., Philadelphia, Pa.; Delrac Corp., Watertown, N. Y.; U. S. Stoneware Co., Akron, Ohio. Resin manufacturers who produce furfuryl alcohol resins suitable for formulating cements are: Borden Co., Chemical Div., New York, N. Y.; Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y.; Furane Plastics, Inc., Glendale, Calif.; Irvington Varnish & Insulator Co., Irvington, N.J.

Resinous cements made with furfuryl alcohol liquid resin admixed with inert fillers remain in the plastic state for troweling purposes for 15 to 30 min., and set to a solid in 36-48 hr. at room temperature. The cements are used as jointing materials for corrosion-resistant tile or brick. In some cases the brick is not merely joined but also backed by a heavy grout of the resinous cements. In other cases the brick and furfuryl alcohol cement is used over a membrane of rubber or vinyl sheeting. This is especially recommended to control the seepage of corrosives in a tank where a static head of liquid is constantly seeking an imperfection in the brick lining. The most commonly used brick for acid-resistant construction is a red or buff dense highly vitrified shale product. Under strong alkaline conditions or for resistance to hydrofluoric acid, carbon brick is employed.

Brick and resin cement construction, in which a layer of substantial thickness is subject to corrosive and/or abrasive process ingredients under conditions of total and continuous immersion or exposure, is used in lining large metal tanks or vessels in the process equipment industry. Important applications for this type of construction are brick-lined reactors, storage tanks, absorption towers, fume stacks, and tanks for neutralization of wastes used throughout the chemical industry in the production of acids, alum, dyes, organic chemicals and solvents, fertilizers, insecticides, plastics, detergents, and soaps.

Industrial brick or tile floors subjected to corrosive chemicals are constructed in a similar manner. Pickling tanks and trenches of this construction have service records

Acid-proof tile floor in dairy is joined with furfuryl alcohol resin cement
Courtesy Atlas Mineral Products Co. of Pa.

Photos this page courtesy Maurice A. Knight Co.

Duct work is fabricated from furfuryl alcohol resin reinforced with glass cloth

of more than 5 yr. and are still in service. Food and beverage plants such as breweries, dairies, bakeries, and meat packing plants use acid-proof tile floors jointed with furfuryl alcohol resinous cement because the latter withstands the reagents used to maintain stringent sanitary requirements.

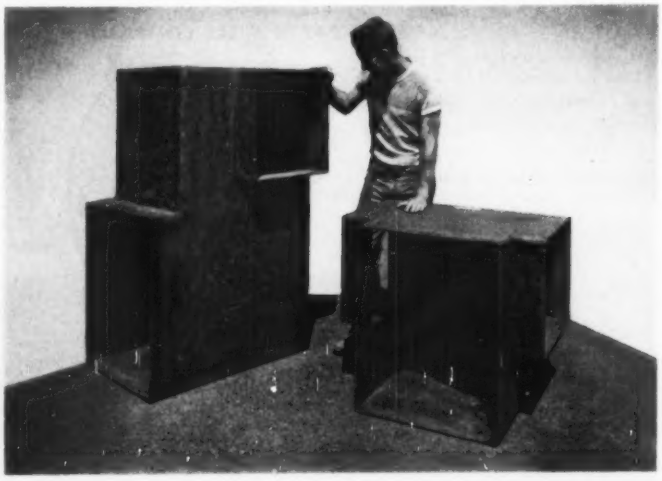
With respect to new developments in flooring, it is interesting to note the use of furfuryl alcohol resin cement in producing a floor having a conductivity in the range of 25,000 to 500,000 ohms. These floors are installed in operating rooms of hospitals in order to reduce the possibility of electrostatic spark discharges and subsequent ignition of the inflammable gases used. Conductive floors for explosives manufacture have also been developed.[2]

Furfuryl alcohol resinous cement plays a role in producing chemical-resistant joints for vitrified clay pipe lines that carry industrial wastes. The acid, alkali, organic liquid, and grease-proof joints are prepared by filling the annular space of the clay pipe with a plasticized sulfur cement after troweling in a fillet and bead of furfuryl alcohol-based cement. The use of the sulfur cement along with the resin cement lowers the over-all joint cost, and takes advantage of the heat of the molten sulfur cement in accelerating the setting of the resin cement, permitting the completed joint to be placed in service more quickly. Joints of this type are rigid and the pipe should therefore be laid on a concrete pad to protect against breakage due to settling.

The pulp and paper industry uses a variety of corrosion-resistant brick linings because it is characterized by the processing of enormous quantities of material in the form of suspensions, slurries, and solutions. In practically every instance the material in process corrodes or would be contaminated by ordinary materials of construction. Furfuryl alcohol resin cements are commonly used in the construction of both sulfite and sulfate digesters, pulp-storage tanks, and towers.

Heavy layers or membranes of furfuryl alcohol resin cements are also finding application as linings without benefit of brick sheathing. So as to minimize the inherent weaknesses of brittleness and shrinkage of cured furfuryl alcohol type resinous cements, they are reinforced with glass fabric. The concept of reinforcing furfuryl alcohol resin cement with a relatively inert and high strength membrane was probably first practiced in the construction of armored stoneware piping. The woven glass fabric impregnated with resinous cement as the armor protected the ceramic from breakage by blows and thermal shock. Now a means of fabricating pipe and ducts with fabric and cement on expendable molds is being developed by several firms. The method has been successfully extended to the low cost fabrication of comparatively large equipment molded in one piece without seams or joints. Special types of chemical processing equipment is designed and constructed of this material,

Furfuryl alcohol resin junctions resist thermal shock and most corrosive chemicals



[2] R. B. Seymour, Southern Power and Industry 69, 86-9 (May), 48-51 (June 1951).

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Table II—Physical Properties of Haveg Compositions*

Properties	*Haveg 60 (Furfuryl alcohol resin)*	*Haveg 41 (Phenolic resin)*
Density, lb./cu. in.	0.063	0.061
Physical strength at 70° F.		
Tensile, p.s.i.	4,000	4,500
Tensile modulus of elasticity, p.s.i.	1,580,000	1,880,000
Compressive, p.s.i.	11,500	11,500
Flexural, p.s.i.	7,500	6,500
Shear, p.s.i.	3,500	3,000
Rockwell Hardness		
75° F.	R106	R110
150° F.	R 99	R 98
225° F.	R 78	R 91
Thermal conductivity, BTU/sq. ft./°F./hour/foot of path	0.203	0.203

* Based on data supplied by the Haveg Corp.

e. g., the Rauh-Klein muriatic acid absorber. The cement-fabric type of construction is strong and self-supporting, and used in the construction of pickling tanks, fume ducts, reels, and numerous other pieces of equipment in the metallurgical, chemical, and textile industry.

Cast Molding

Acid-catalyzed furfuryl alcohol resin filled with acid-digested asbestos is the basis for cast molded equipment, vessels, and parts known in the industry as Haveg 60. The molding process differs from conventional hot molding practice through the use of light weight and inexpensive molds and the application of heat and low pressure via large oven-type autoclaves. The molded plastic in the form of pipe, ducts, valves, vats, hoods, and tanks is used widely for its corrosion resistance in the chemical, textile, petroleum, and metallurgical industries. The product is a good heat insulator and unaffected by thermal shock or sustained temperatures up to 265° F. Wall thicknesses are normally from ¼ to 2 in., depending upon the application. Minor surface damage on the molded equipment does not affect its functionality as it possesses uniform corrosion resistance throughout the mass.

Brick sheathing for pickling tank is laid in furfuryl alcohol resin cement

Courtesy Nukem Products Co.

Haveg 41 is based on a composition of phenol-formaldehyde resin and acid-digested asbestos fiber. Approximate physical strengths of the Haveg compositions are given in Table II. Haveg is not recommended in any grades for use with strong nitric or chromic acid, sulphuric acid (concentrated), sodium hypochlorite, aniline, pyridine, bromine, and iodine. Haveg 41 should not be used with acetone, acetic anhydride, ethyl acetate, and caustic compounds. Haveg 41 and 60 are not to be used with fluorine compounds, due to chemical attack on asbestos. These data are based on a test method given in Chem. Eng., July, 1949, p. 97; Aug., 1949, p. 214.

Impregnating Solutions

Several properties of furfuryl alcohol are utilized in formulating impregnating solutions of low viscosity—namely, the ease of resinification with acidic catalysts, high wetting or penetrating ability, and high boiling point. An application of such a system is the saturant used to impregnate porous stoneware and sandstone. Furfuryl alcohol in monomeric form is formulated as a catalyzed solution which is relatively stable up to room temperature, low in viscosity, and capable of rapid resinification *in situ* after heat is applied to the impregnated stone. The impregnated and cured product is nonporous, has greater hardness and flexural strength, and is improved in resistance to corrosion. Stone laboratory table tops and ceramic sinks are regularly fabricated of such a product via impregnation plus a surface coating of essentially the same solution. The whole is then cured in one baking step to weld the entire system together. The following data are typical of the physical properties of

Courtesy Atlas Mineral Products Co. of Pa.

Before finishing newly-laid tile floor, excess hard furfuryl alcohol resin mortal is removed from surface

the impregnated and cured sandstone product:

Compressive strength, p.s.i.—11,000 to 15,000
Flexural strength, p.s.i.—2,500 to 3,000
Tensile strength, p.s.i.—1,000 to 1,500
Tensile modulus of elasticity, 10^6 p.s.i.—4.0 to 5.0
Coefficient of abrasive hardness—16

The natural porous stone or ceramic stoneware to be impregnated must not contain excessive amounts

(Continued on page 195)

Citric Acid Ester Plasticizers

by FRANCIS J. PRESCOTT* and G. O. CRAGWELL*

CITRIC acid and its esters have found considerable use in the plastics industry—the acid itself in lacquers and in the preparation of certain types of resins, and the esters as plasticizers for the natural and synthetic resins. Citric acid is a monohydroxy, tricarboxylic acid which accounts for its multi-functionality. It is available commercially in two forms, hydrated (USP) and anhydrous, both of which are readily soluble in water but comparatively insoluble in most nonpolar organic solvents. As commercially produced, these products have a very high degree of purity and find extensive use in pharmaceutical and food products for human consumption. The anhydrous form is the preferred product for the plastics industry, particularly for condensation processes in which water is eliminated.

Originally, citric acid was prepared from the juice of lemons and limes; but today the major portion of it is prepared by the fermentation of sugar-containing solutions. The development of this process resulted in a drastic reduction in the cost of the acid.

Because of its chemical structure, citric acid serves as an ideal starting material for the preparation of plasticizers. In addition to undergoing esterification with the usual alcohols, the citric acid esters thus prepared may also be etherified or acylated. Therefore, it is possible to "tailor-make" a number of products which serve as excellent plasticizers. The volatility of the citric plasticizers can be regulated by the molecular weight of the alcohol with which the acid is combined, and also by acylating the hydroxyl group of this acid. In general, the higher the molecular weight of the plasticizer the lower its volatility and also its compatibility. Further regulation of the properties of these plasticizers can be obtained by preparing mixed esters with two or even three different alcohols. Partial or acid esters can also be prepared and preliminary studies have indicated that it is possible to prepare metal salts of the partial esters. These materials have promise as stabilizers for certain of the natural and synthetic resins.

* Chas. Pfizer and Co., Inc.

Table I—Properties of Citric Acid Esters and Corresponding Phthalates (7)

Property	*Diethyl phthalate*	*Triethyl citrate*	*Acetyl triethyl citrate*	*Tributyl citrate*	*Acetyl tributyl citrate*	*Dibutyl phthalate*
Molecular weight	222.2	276.3	318.2	360.4	402.6	278.3
Specific gravity at 25° C.	1.120	1.136	1.135	1.042	1.046	1.045
Refractive index at 25° C.	1.5002	1.4405	1.4386	1.4431	1.4408	1.4915
Boiling range at 1 mm. Hg., °C.	110	126-7	131-2	169-70	172-4	150
Volatility[a], %	29.1	13.5	9.9	3.4	0.9	6.5
Solubility in water at 25° C., g/100 m.	0.9	6.5	0.72	0.002	0.002	0.002
Hydrolysis[b], %	0.1	0.1	0.1	0.1	0.1	0.1
Compatibility[c] with:						
Cellulose acetate	C	C	C	P	P	P
Cellulose acetate butyrate	C	C	C	P	P	P
Cellulose nitrate	C	C	C	C	C	C
Ethyl cellulose	C	C	C	C	C	C
Polyvinyl chloride	C	C	C	C	C	C
Polyvinyl chloride-acetate	C	C	C	C	C	C
Polyvinyl-vinylidene-chloride	C	C	C	C	C	C
Polyvinyl acetate	C	C	C	C	C	C
Polyvinyl butyral	C	C	C	C	C	C
Chlorinated rubber	C	C	C	C	C	C

a Loss from 10 g. sample at 105° C. for 120 hr.
b In boiling water for 1 hr.
c Code for compatibility: C — Compatible; P — Limited compatibility.

One of the earliest references to the preparation of esters of citric acid appeared in 1837, when the preparation of triethyl citrate was described (14)[1]. It was not until over half a century later, however, that the use of certain citric acid esters—namely, triethyl citrate and triisobutyl citrate—were mentioned as plasticizers for cellulose nitrate (23). Aryl alkyl citric acid esters (18,25, 26), citric acid esters of normal alcohols with 6-15 carbon atoms (10), mixed esters of citric acid (5), and α-naphthylmethyl esters of citric acid (24) have also been recommended as plasticizers for the various cellulosic derivatives.

Currently, there are commercially available four esters of citric acid. These are triethyl citrate, tributyl citrate, acetyl triethyl citrate, and acetyl tributyl citrate. The physical and chemical properties of these esters, including their compatibility with certain of the natural and synthetic resins, are shown in Table I. All the esters had a minimum purity of 99% and were colorless (less than 50 Hazen).

Triethyl citrate is a water-white, moderately high boiling liquid. It is soluble in most common organic solvents, although it is relatively insol-

[1] Numbers in parentheses refer to references at end of article, p. 201.

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Table II—Properties of Cellulose Nitrate Films Plasticized with Citrate Esters (7)

Property	*Triethyl citrate*	*Acetyl triethyl citrate*	*Tributyl citrate*	*Acetyl tributyl citrate*	*Dibutyl phthalate*
Tensile strength					
10% ester, kg/cm²	647	618	538	570	696
25% ester, kg/cm²	575	595	561	615	610
33⅓% ester, kg/cm²	500	582	455	556	522
Elongation					
10% ester,%	3	5	3	8	5
25% ester, %	6	10	5	8	7
33⅓% ester, %	6	15	5	8	7
Yellowing[a]					
10% ester, color unit	1.2	1.9	1.3	1.8	6.0
25% ester, color unit	0.8	1.8	1.1	0.9	7.3
33⅓% ester, color unit	1.3	2.2	1.1	0.6	7.2
Adhesion to metal[b]	Lifted	Very good	Lifted	Very good	Lifted slightly
Water permeability[c], *g.*	3.80	—	3.13	—	3.24
Volatility[d]					
24 hr., %	30.0	25.0	12.0	8.0	32.5
48 hr., %	33.5	26.0	14.5	11.5	34.0
172 hr., %	35.0	32.0	24.0	23.5	34.0

a After 5 hr. exposure to ultra-violet light (unexposed control had 1.1 color unit).
b After 7 wk. immersion in water.
c Water vapor through films made with 25% ester.
d Loss from films exposed at 100-105° C. Film consisted of 12.5 g. cellulose nitrate plus 7.5 g. of ester (total plasticizer 37.5%).

uble in oils and greases. Triethyl citrate is unique in that it is somewhat soluble in water. This ester is reported to be resistant to fungi (3) and exhibits a wide range of compatibility for the natural and synthetic resins. It has been shown to have a low order of toxicity.

Table III—Properties of Plasticized Cellulose Acetate Molding Compounds[a] (7)

	Acetyl triethyl citrate plasticizer	*Dimethyl phthalate plasticizer*
Rockwell hardness, M scale	43	34
Water absorbed[b], %	1.60	1.06
Charpy impact strength, ft.-lb./in.	5.6	5.6
Volatile loss[c], %	17.5	21.1
Warp[d], in.	1/32	7/8

a 35% plasticizer content.
b After 48 hr. immersion.
c After 48 hr. at 130° C.
d A.S.T.M. test D 741-47 T (modified).

Acetyl triethyl citrate is a water-white liquid, miscible with most common organic solvents. It is less volatile and less water soluble than the triethyl ester. This ester is resistant to hydrolysis even after boiling in water for 6 hours. Acetyl triethyl citrate exhibits the same degree of resin compatibility and order of toxicity as does triethyl citrate.

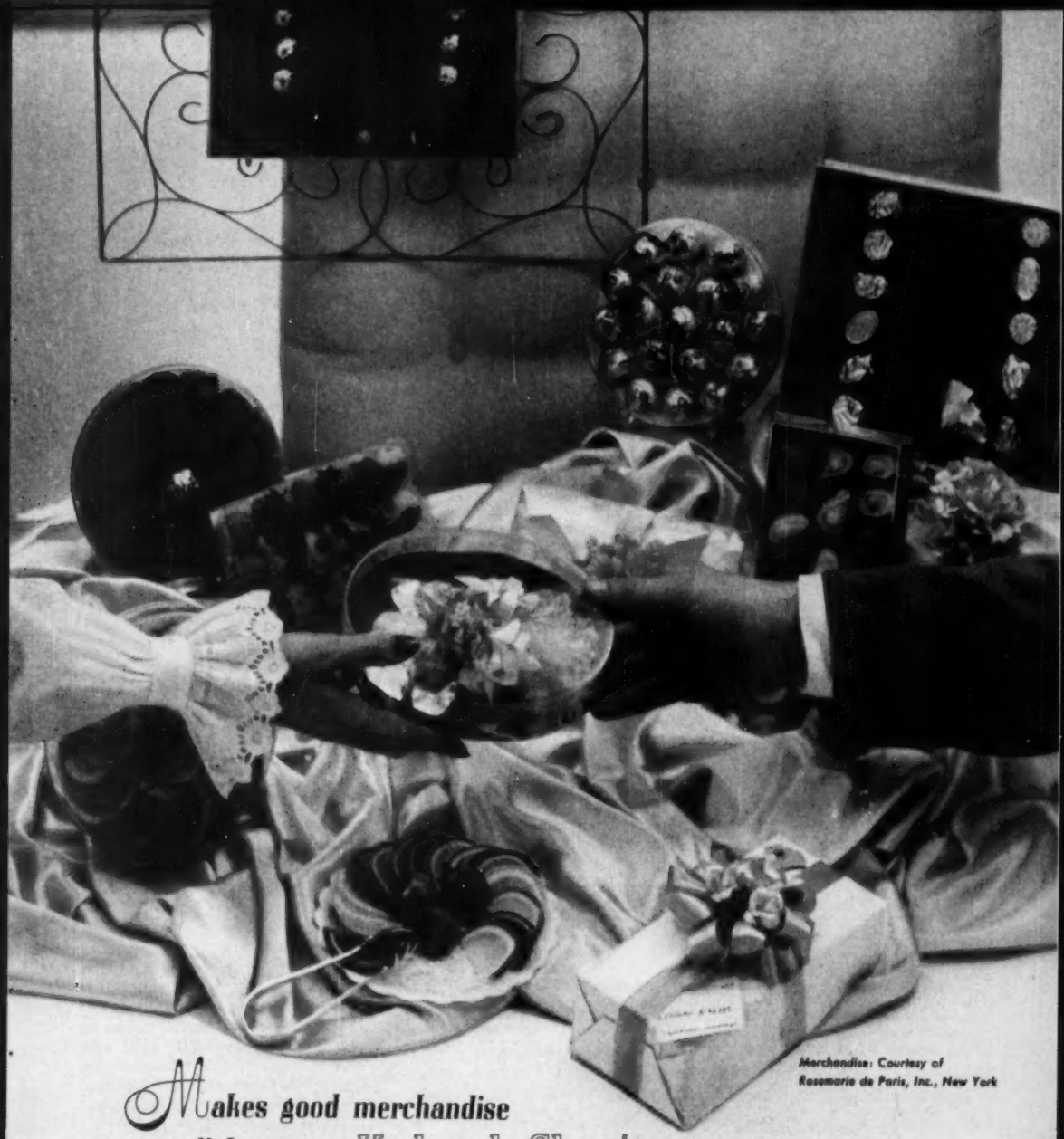
Tributyl citrate is a water-white, high boiling liquid which is soluble in most common organic solvents. It is reported to be resistant to fungi (3) and also to hydrolysis. This ester exhibits an extremely low order of toxicity. Tributyl citrate is compatible with most of the natural and synthetic resins. However, it is only limitedly compatible with cellulose acetate and the other mixed acetate esters.

Acetyl tributyl citrate is a water-white, high boiling liquid which is soluble in most common organic solvents. It is insoluble in water and resistant to hydrolysis. Toxicity studies have shown that this ester may be considered essentially nontoxic. Acetyl tributyl citrate is compatible with most natural and synthetic resins, though only to a limited degree with cellulose acetate and cellulose acetate butyrate.

Triethyl citrate and tributyl citrate have been shown to be useful as plasticizers for cellulose nitrate (12, 19) and polyvinyl acetate (20, 21). The former is also a good plasticizer for cellulose acetate (9). When included in a phenol-formaldehyde resin, it is believed to undergo a reaction with the resin (22); this results in the formation of an internally plasticized polymer, since when subjected to vacuum the presence of triethyl citrate is not evident. The butyl ester of citric acid is a useful antifoaming agent when used in the production of casein (4), as well as in rubber latex impregnating solutions (16). This indicates that tributyl citrate may be considered as an antifoaming agent in the production of other resins or coating formulations, such as vinyl resin latices. The acetylated forms of citric acid esters, particularly acetyl triethyl citrate and acetyl tributyl citrate, are stabilizers for polyvinylidene chloride (15). Acetyl triethyl citrate is particularly useful with ethyl cellulose, since its incorporation in a formulation of this polymer raises the softening point of the stock (8).

Toxicity

Extensive toxicity studies have been undertaken to determine the order of toxicity of triethyl citrate, tributyl citrate, and their acetyl derivatives. Acute and subacute toxicity studies carried out with rats and cats (7) indicate that both butyl esters possess no toxic properties and fail to produce toxic effects because they are not absorbed by the gastro-intestinal tract. Furthermore, neither of the compounds produce local irritation of mucosa of the gastro-intestinal tract in the test animals. The two triethyl compounds exhibit a slightly higher order of toxicity than do the butyl esters. However, their toxicity is sufficiently low so that these esters may be con-



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sidered safe for most applications.

The chronic toxicity of acetyl tributyl citrate has also been thoroughly investigated (7). The rats used in this study showed no toxic effect after eating diets containing as much as 20,000 ppm. of acetyl tributyl citrate for 2 years. This was also the case with two dogs who were fed daily doses of 140 mg. of acetyl tributyl citrate for a similar length of time. In the case of the rats, there was no significant difference between the growth of the animals receiving acetyl tributyl citrate and the control animal, nor did there appear to be any difference in the behavior of the animals noted. In the case of acetyl tributyl citrate, it was concluded that in view of the low toxicity of acetyl tributyl citrate, its use as a plasticizer for food wrappers does not present a hazard to public health. Two government agencies have indicated that acetyl tributyl citrate may be incorporated as a plasticizer for vinyl resins used to prepare food wrappings (7).

Plasticizers for Cellulosics

The four commercially available citric acid esters have been compared with dibutyl phthalate as plasticizers for cellulose nitrate (Table II) and the citric acid esters were found to offer a number of advantages. The films prepared with triethyl citrate and tributyl citrate, and their acetylated forms, exhibited lower volatile losses after exposure in an oven at 100 to 105° C. In addition, on the basis of degree of yellowing after exposure to ultraviolet light, the films plasticized with the esters of citric acid undergo the least discoloration. Permeability studies have indicated that while the films prepared with triethyl citrate are less resistant to water permeation than the dibutyl phthalate films, the tributyl citrate formulation is more water resistant than the latter. The cellulose nitrate films prepared with the acetylated ethyl and butyl esters exhibit excellent adhesion to metal even after 7 weeks' immersion in water.

Since triethyl citrate and acetyl triethyl citrate are solvent plasticizers for cellulose acetate, they are particularly recommended for use with this polymer (Table III). These esters have been found to be less volatile than dimethyl and diethyl phthalates which are widely used as plasticizers for this resin. Molding compounds prepared with acetyl triethyl citrate have been found to be less susceptible to warpage than a formulation prepared with dimethyl phthalate.

Tributyl citrate and acetyl tributyl citrate exhibit only a limited degree of compatibility with cellulose acetate. These esters are recommended for use as partial replacements for more active cellulose acetate plasticizers such as dimethyl phthalate or diethyl phthalate. Because of their higher boiling points, the partial replacement of the aforementioned esters with the butyl citrates will result in compounds which will exhibit lower volatile losses.

Plasticizers for Vinyl Polymers

The esters of citric acid have been found to be useful plasticizers for the vinyl chloride polymers and copolymers. While triethyl citrate and acetyl triethyl citrate are more volatile than most of the conventionally used vinyl resin plasticizers, they do offer certain advantages. They will serve effectively as processing aids, particularly for those resins or formulations which require plasticization only during processing. The brittle temperatures of vinyl chloride-acetate copolymers plasticized with triethyl citrate and acetyl triethyl citrate are −35 and −34° C., respectively, as compared with −42° C. for a dioctyl phthalate formulation containing the equivalent amount of plasticizer.

Tributyl citrate is a promising plasticizer for the vinyl chloride polymers and copolymers. Films and sheetings possessing a "soft hand" have been prepared. The results of a laboratory study in which tributyl citrate was compared with dioctyl phthalate and octyl phenyl phosphate plasticizers for polyvinyl chloride are presented in Table IV. Though somewhat more volatile than dioctyl phthalate, it will serve as an efficient secondary plasticizer because of its better plasticizing efficiency. Furthermore, its low order of toxicity indicates that it can be used to advantage in the preparation of nontoxic films and sheetings.

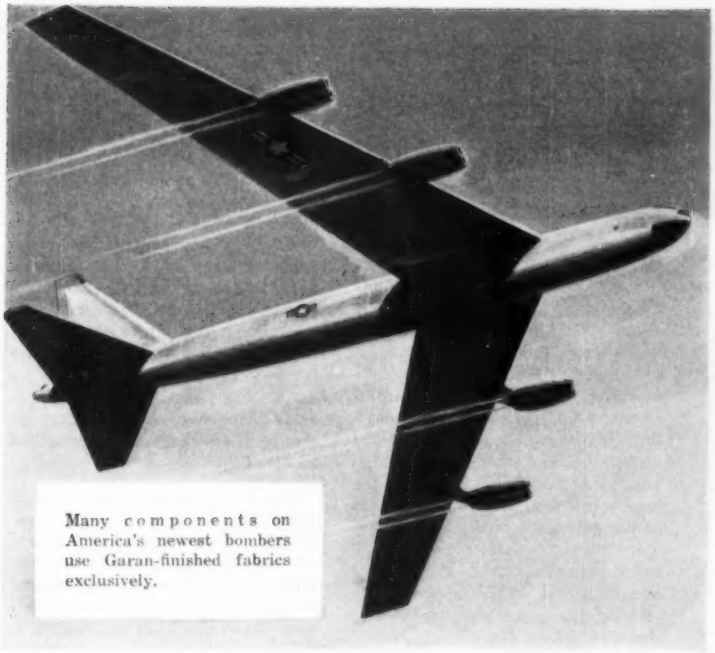
The most promising plasticizer of the currently available citric acid esters is acetyl tributyl citrate, an excellent plasticizer for polyvinyl chloride. While it is of particular interest to the manufacturers of food wrappings and other preparations which require nontoxic plasticizers, it is also valuable as a general purpose plasticizer. Acetyl tributyl citrate is compared with dioctyl phthalate and octyl phenyl phosphate as plasticizers for polyvinyl chloride in Table IV. Films and sheetings prepared with this citric acid ester possess a "soft hand" and good "drape."

(*Continued on p. 200*)

Table IV—Properties of Plasticized Polyvinyl Chloride 75-mil Sheet[a] (7)

Property	*Dioctyl phthalate (DOP)*	*Octyl phenyl phosphate (OPP)*	*Tributyl citrate*	*Acetyl tributyl citrate (ATC)*	*ATC and DOP*	*ATC and OPP*
Modulus at 100% elongation, p.s.i	1500	1400	1200	1400	1400	1400
Ultimate tensile strength, p.s.i.	2400	2400	2600	2600	2600	2600
Ultimate elongation, %	310	300	350	340	340	340
Tear resistance, lb./in.	370	380	300	310	360	350
Brittle temperature, °C.	−25	−25	−30	−25	−25	−25
Volatility[b], %	3.7	7.2	8.8	6.4	5.1	6.9
Water resistance at 25° C.						
Gain in weight, %	0.11	0.18	0.31	0.24	0.16	0.21
Soluble matter, %	0.03	0.04	0.28	0.13	0.07	0.09
Oil resistance[c], %	0.60	0.95	1.48	0.60	0.62	0.88

a Sheet prepared with 50 parts plasticizer and 2 parts calcium stearate plasticizer per 100 parts polyvinyl chloride. Equal parts of each plasticizer were used in case of mixtures.
b Loss after 4 days at 100° C.
c A.S.T.M. oil #3 used A.S.T.M. test D 543-43.



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PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

General

NEW PLANT FOR U.F. MOULDING MATERIAL. Brit. Plastics *25*, 194-7 (June 1952). A new British plant for the production of urea-formaldehyde molding materials is described.

A SYSTEMATIC STANDARDIZING PROCEDURE FOR ELECTRICAL MOLDINGS. W. D. Owen. Brit. Plastics *25*, 188-93 (June 1952). A basic plan for the British Standards on plastics for use in the manufacture of electrical components is discussed.

Materials

HIGHLY CROSS-LINKED POLYBUTADIENE. J. A. Coffman. Ind. Eng. Chem. *44*, 1421-8 (June 1952). On being heated at about 250°C, polybutadiene, prepared by emulsion polymerization, is converted, over a period of several days, from a rubber to a hard, rigid material. The hardening process is one of thermal polymerization, with scission of carbon-carbon bonds activated by two double bonds as the probable radical source. Both inter- and intramolecular polymerization, cross linking, and cyclization occur. During the hardening process the following changes in physical properties are observed. The density increases from 0.91 to 1.01. Solvent swelling drops from about 200% to zero. Impact strength shows a steady decline as the material becomes more rigid, while compressive and flexural strengths have maxima at about 4 days' baking at 255° C. The second-order transition point rises from −85° to about 160°C and then disappears. The coefficient of linear expansion at 25°C decreases from 22.5×10^{-5} to 7.5×10^{-5}. The material becomes less sensitive to heat under heat distortion test conditions, and a fairly good correlation between second-order transition point and heat distortion is observed. The kinetic theory of rubber elasticity is used in interpreting the mechanical behavior of the hardened polybutadiene, although it is not ordinarily applied to materials as rigid and highly cross-linked as this. The use of the theory is justified by the observation that the flexural modulus is directly proportional to the absolute temperature, at temperatures above the second-order transition point. Interpretation of some of the data seems to require that segments of the polymer chains be in motion more than 100° below the second-order transition point. Polybutadiene, prepared with sodium as the catalyst, changes in physical properties with baking at a rate about four times as fast as does the emulsion polymer. Furthermore, the ratio of cross linking to cyclization is higher in the sodium polymer. These differences are believed to be due to the higher content of dangling vinyl groups in the sodium polymer.

PHENOLIC RESINS. H. F. Müller and I. Müller. Kunststoffe *42*, 193-9 (July 1952). Changes in the production and processing of phenolic resins affect their composition and cause changes in the molded products. An investigation was made to determine the relation between production and composition of the phenolic resins and the properties of the finished products by compression molding parts from resin fractions and different types of resins with one kind of filler. The molding conditions and the test results obtained are given.

Molding and Fabricating

PLATEN HEATING BY MAINS FREQUENCY INDUCTION. Brit. Plastics *25*, 208-209 (June 1952). Induction heating is widely used throughout the plastics industry for various purposes, but the distinction between high frequency and mains frequency is not always clearly appreciated. Mains frequency induction heating has the advantage that it does not require expensive or fragile apparatus. With this method the heat is generated through the action of eddy currents set up in the platen when a mains frequency alternating current is passed through built-in induction coils; thus the heat is created in the metal of the platen itself and is not brought there by conduction as in some other electrical methods of heating. It is this characteristic which gives induction heating its advantages over other forms of electrical heating, since it leads to lower current consumption and facilitates accurate control. Furthermore, burnt-out connections, excessive heat losses, and troubles rising from the stresses and strains set up by big temperature differences are avoided. The apparatus and operating characteristics are described in detail.

NEW PRINTING AND COATING TECHNIQUE FOR RIGID SHEET. Brit. Plastics *25*, 142-5 (May 1952). A new method of treating plastics sheeting, which can be adapted to integral printing, laminating by fusion, surface decorating, and embossing, is now being carried out on a commercial scale. Acrylic, polystyrene, vinyl, and vinyl co-polymer sheeting can all be treated by this technique. Fundamentally the process consists of applying inks or coating compounds that are based on partially polymerized monomer materials to a plastic sheet with which they are compatible; the print or coating is then fused and polymerized with the sheet in a hydraulic press. The details of the process are given and applications are described.

STRESS GREMLINS IN THERMOSETTING PLASTICS. H. M. Quackenbos, Jr. SPE J. *8*, 19-21 (Apr. 1952). The problems concerned with residual stresses in molded plastics are discussed from the viewpoint of both the laboratory technician and the molder. The use of laboratory tests can be enhanced for the molder by proper interpretation.

Applications

ION EXCHANGE RESINS IN SUGAR CANE JUICE PROCESSING. J. H. Payne, H. P. Kortschak, and R. F. Gill, Jr. Ind. Eng. Chem. *44*, 1411-21 (June 1952). In considering possible ion exchange applications, an important factor is the potential life of the resins. For a particular resin this life depends upon conditions of the treatment and the composition of the

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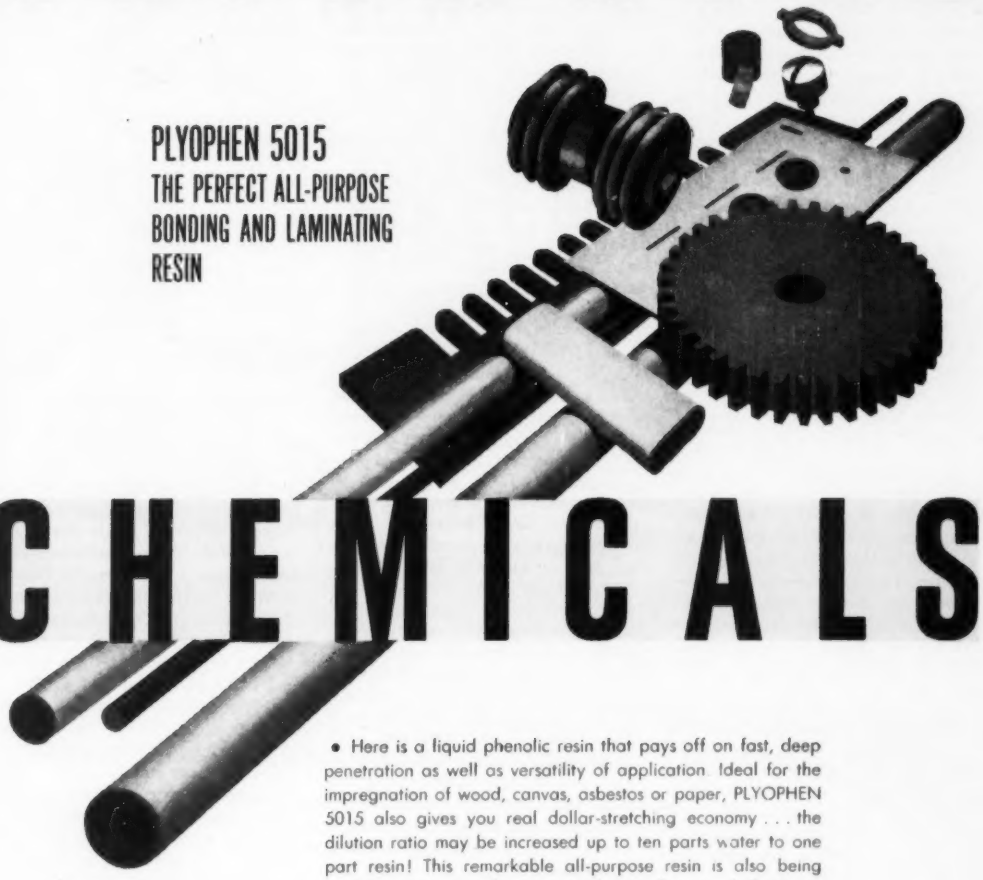

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solution being treated. A standard procedure for testing ion exchange resins is described, and the relative performance characteristics of 17 resins in the treatment of sugar cane juice measured. The results show that several ion exchange resins perform well up to 1500 cycles, and indications are that their useful life is considerably beyond this. The anion exchange resins lose their capacity at a much more rapid rate than the cation exchange resins. The data indicate that the better resins maintain capacity over a sufficient period of time to make them of economic value in the treatment of cane juice. It is probable that similar results would be obtained in applications of a related nature.

RESIN ADHESIVES. E. C. Lenz and R. Stone. Modern Packaging *25*, 94-7, 180, 182, 185 (June 1952). The properties of resin emulsion adhesives used in packaging are reviewed. The methods of handling and applying are emphasized.

AN ELECTROMAGNETIC PLASTIC VALVE FOR ORGAN PIPES. W. Laeis. Kunststoffe *42*, 201-2 (July 1952). The construction of pipe organs can be considerably simplified by attaching under each pipe a valve that is operated directly from the key board by a current impulse. The valves are made from injection molded polystyrene and polyethylene.

NON-STICK MACHINE PARTS. Modern Packaging *25*, 116-8 (Apr. 1952). Rollers, sealers and hoppers of packaging machinery are made of or finished with polytetrafluoroethylene. This makes cleaning operations relatively easy because the adhesives do not adhere to this plastic.

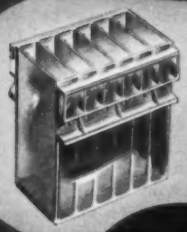
SELECTING AN EMBEDMENT SYSTEM FOR ELECTRONIC COMPONENTS. D. G. Heitert and H. W. Niemann. Elec. Manuf. *49*, 113-117, 322, 324, 326, 328 (May 1952). The requirements for a satisfactory embedding resin for electronic components are described. A group of polyester casting resins has been found to answer these requirements.

Properties

EXPANDED PLASTICS IN THE TROPICS. Brit. Plastics *25*, 165 (May 1952). The results of tropical exposure tests with expanded plastics are summarized. Expanded phenolic showed the greatest resistance to these conditions, and was, in fact, little affected, while the cellular urea-formaldehyde showed the least resistance, suffering excessive crumbling and general disintegration. Expanded polystyrene and expanded polyvinyl chloride remained fairly sound after the trial; but polystyrene showed excessive surface pitting as a result of sand abrasion at the desert site, while polyvinyl chloride showed some surface break-up as a result of fungus attack at the jungle site. The remaining two plastics samples, cellulose acetate and polyvinyl formal, although they exhibited no crumbling or disintegration, displayed warping and blistering and were permanently distorted. The expanded ebonite material tested also showed excessive warping and permanent distortion. All the samples exposed at the jungle site became infected with mold, but the only materials that appeared to be affected to any extent were expanded polyvinyl chloride, expanded cellulose acetate, and cellular urea-formaldehyde. The only material exposed at the termitary which appeared to be entirely free from insect attack was expanded cellulose acetate, but only with cellular urea-formaldehyde was insect attack excessive. Both expanded polystyrene and cellular urea-formaldehyde in the termitary were penetrated by plant roots. In the polystyrene specimen some of the cells were of the communicating type; the urea-formaldehyde specimen was produced by a foaming process yielding a product of extremely weak and very absorbent cell structure; it might be expected that such products would be easily pierced by growing vegetation.

EFFECT OF DIFFERENT CATALYSTS AND AMOUNTS OF STYRENE MONOMER ON STRENGTH AND DURABILITY OF GLASS-CLOTH PLASTIC LAMINATES. A. A. Mohaupt and A. D. Fread. U. S. Dept. of Agriculture Forest Service, Forest Products Laboratory Report No. 1825, 21 pp. (Mar. 1952). Static bending and Izod impact tests were made to determine how the strength and durability of glass-cloth plastic laminates were affected when the resin formulation was varied as to curing conditions, amounts of catalyst and accelerator, and amounts of styrene monomer added to the resin. Laminates made with three typical polyester resins were tested after various types of exposure. Because of the large number of variables covered in the study and the relatively small number of tests for each variable, positive conclusions cannot be drawn. Increasing the amount of catalyst or increasing or decreasing the styrene monomer content from the manufacturers' recommendations for some typical resin formulations used to make glass-cloth plastic laminates resulted in relatively small changes in static bending strength for the test conditions studied. These conditions included standard conditions (73° F., 50% relative humidity), water immersion for 30 days, outdoor weathering (3, 6, and 12 months), 10 cycles alternating low and high relative humidity at 175° F., ½ hr. at 160° F., ½ hr. at 350° F., and 192 hr. at 350° F. Decreasing the catalyst content by 50% resulted in some loss in bending strength at standard conditions, after water immersion, after the cyclic exposure, and after ½ hr. at 160° F. Heat-curing combinations of catalyst and resin (using manufacturers' recommendations) appeared to produce better laminates than the room-temperature-curing combinations. In most cases a reduction in bending strength resulted from exposure to the weather, elevated temperatures, immersion in water, and a cyclic exposure of alternating high and low relative humidity at 175° F. The reductions due to exposure were greater than the effects resulting from variations in catalyst and styrene monomer content. The modulus of elasticity was affected least by these exposures; the modulus of rupture was decreased considerably more; and the strength at proportional limit was the property which was reduced most.

SEPARATION OF GASES BY MEANS OF PERMEABLE MEMBRANES. D. W. Brubaker and K. Kammermeyer. Ind. Eng. Chem. *44*, 1465-74 (June 1952). Permeabilities for a variety of gas-film combinations were obtained. The plastic films included in the study covered experimental and commercial films and the basic film materials covered most of the commercially important compounds. The effect of temperature upon the permeation of gases through plastic films is not readily predictable and it is recommended that permeability



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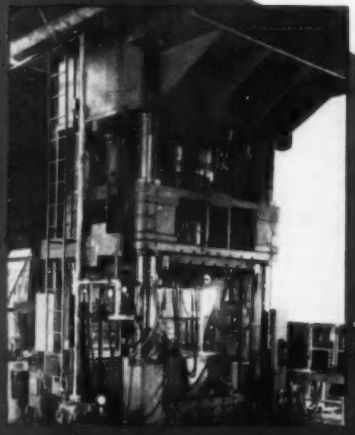

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data be reported for at least two and preferably three temperatures. While the temperature effect can in many cases be expressed by means of two parameters—i.e., the permeability at infinite temperature and the activation energy of permeation—the values of these parameters show such wide variations in magnitude for different gas-film combinations that it is considered impractical to use them as a ready means of characterization. The reporting of actual permeabilities is to be preferred. The effect of plasticizer in the film formulation may or may not result in a uniform change in permeability. Both the amount and the type of plasticizer can produce pronounced changes in the permeability behavior of films.

LIGHT STABILITY OF POLYSTYRENE AND POLYVINYLIDENE CHLORIDE. L. A. Matheson and R. F. Boyer. Ind. Eng. Chem. *44*, 867-74 (Apr. 1952). The various factors involved in the light stability of polystyrene and polyvinylidene chloride are evaluated. These include monomer, sulfur, antioxidants, oxidation, stabilizers, and wavelength effect.

Testing

EXTRACTION AND DETERMINATION OF PLASTICIZERS FROM CELLULOSE ACETATE PLASTICS. G. S. Whitnack and E. S. Gantz. Anal. Chem. *24*, 1060-61 (June 1952). A procedure is described for recovering at least 98 percent of the plasticizer present in cellulose acetate plastics. This consists of extraction with a mixture of Skellysolve B and absolute ethyl alcohol (1:1) in a semi-micro-Soxhlet apparatus.

AN INSTRUMENT FOR DETERMINING THE SETTING TIME OF HOT-PRESS ADHESIVES. N. A. de Bruyne. Brit. Plastics *25*, 156-9 (May 1952). An instrument called a setometer is described, for determining the setting time of adhesives. The principle of the setometer consists in dragging a weighted inclined pin through the adhesive contained in a shallow and narrow horizontal trough. When the adhesive sets, it pushes up the inclined pin which then rides on top of the hardened glue layer; the weighted pin is rigidly linked to a pencil which leaves a trace on a strip of paper as long as the pin remains in the adhesive. Since the pin is dragged along at a known speed, the

length of the trace is a direct measure, as well as a permanent record, of the time taken for the adhesive to set. The trough is 2 mm. deep and 3.5 mm. wide and is machined out of a brass block with channels on the underside to provide for circulation of water or oil from a thermostatically-controlled bath. Results obtained with several adhesives are reported.

MORE PACKAGING INSTITUTE PROPOSALS. Modern Packaging *25*, 134-7 (Apr. 1952). Methods for determining the effect of alkali, of light, and of the packaged product on all types of materials used in packaging are described.

TESTING OF POLYVINYL CHLORIDE STABILIZERS. K. Stoeckhert. Kunststoffe *42*, P45-6 (June 1952). The stability of polyvinyl chloride mixtures depends on all the individual components as well as on the kind and amount of stabilizer. The preparation of test specimens is described and a simple evaluation method to determine their heat, light, and weathering properties is given.

Chemistry

COPOLYMERIZATION CHARACTERISTICS OF FUMARONITRILE. C. C. Price and R. D. Gilbert. J. Polymer Sci. *8*, 577-81 (June 1952). Copolymerization of fumaronitrile with styrene and methyl methacrylate was investigated.

CATALYSIS BY ANION EXCHANGE RESINS. C. J. Schmidle and R. C. Mansfield. Ind. Eng. Chem. *44*, 1388-90 (June 1952). Ion exchange resins are useful as catalysts for organic reactions because of the ease with which they may be separated and reused. Undesirable side reactions, such as polymerization, often may be avoided through their use, and the reaction products may be obtained free from contamination with catalyst. The catalytic activity of some of the newer types of anion exchange resins are reported. The use of these resins as catalysts for cyanohydrin formation, benzoin condensations, diacetone alcohol formation, cyanoethylation reactions, and nitroalcohol formation is described. The techniques employed in these cases may be adapted to continuous processes in many instances involving relatively simple procedures and equipment.

U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

PLASTIC SHEET. H. Warp (to Flex-O-Glass). U.S. 2,598,866, June 3. Apparatus for continuously forming sheet plastic.

COPOLYMERS. P. O. Tawney (to U.S. Rubber). U.S. 2,599,027-8, June 3. Copolymers of tris-2-alkenyl aconitates, 2-alkenyl alcohols, and olefinic benzenes.

COPOLYMERS. D. M. McQueen (to Du Pont). U.S. 2,599,119, June 3. Ethylene - butene - 1,4 - dioic acid monoester copolymers.

COPOLYMERS. P. S. Pinkney, B. C. Pratt, and W. J. Wayne (to Du Pont). U.S. 2,599,123, June 3. Copolymers of ethylene with an alkyl acrylate and an alkyl monoester of a butene-1,4-dioic acid.

TANNING. J. T. Thurston and P. Adams (to American Cyanamid). U.S. 2,599,142, June 3. Tanning with a sulfoaromatic melamine-formaldehyde resin.

POLYMERS. R. W. Upson (to Du Pont). U.S. 2,599,144, June 3. Polymeric N-boroureas.

COPOLYMERIZING. B. S. Friedman (to Sinclair Refining). U.S. 2,599,-249, June 3. Copolymerizing ethylene with butadiene.

POLYMERIZATION. R. W. Upson (to Du Pont). U.S. 2,599,300, June 3. Polymerization employing amidines having azo groups.

ADHESIVE. R. M. Banks and R. W. Lahey (to American Cyanamid). U.S. 2,599,359, June 3. Method of bonding sheet material.

MOLDING. A. B. Leerburger. U.S. 2,599,400, June 3. Making stable molding composition of low shrinkage.

COPOLYMERS. R. W. Upson (to Du Pont). U.S. 2,599,501, June 3. Reaction of phosphorus halides with monoolefin-carbon monoxide copolymers.

ABRASIVES. C. E. Wooddell, G. Van Nimwegen, and E. T. Hager (to Carborundum). U.S. 2,599,506, June 3. Abrasive bonded with a vulcanized copolymer of an elastomer and an unsaturated ester.

STABILIZERS. W. W. Crouch and J. F. Howe (to Phillips Petroleum). U.S. 2,599,544, June 10. Stabilization of olefin-sulphur dioxide resins with sulfur or sulfides.

RESIN. R. E. Davies (to Celanese). U.S. 2,599,616, June 10. Aging and polymerizing impure methyl vinyl ketone.

CELLULOSE DERIVATIVES. W. F. Filbert (to Du Pont). U.S. 2,599,620, June 10. Preparation of carboxymethyl cellulose.

COPOLYMERS. R. M. Joyce, Jr., (to Du Pont). U.S. 2,599,640, June 10. Copolymer of chlorotrifluoroethylene, an olefinic hydrocarbon, and a vinyl carboxylate.

POLYMERS. L. F. Brooke (to California Research). U.S. 2,599,743, June 10. Polymerizing propylene in the presence of phosphoric acid.

POTTING COMPOSITION. C. W. Kleiderer (to U. S.). U.S. 2,599,762, June 10. Hydrogenated castor oil, paraffin, ethyl cellulose, and hydroquinone monobenzyl ether.

POLYMERS. H. Wittcoff (to General Mills). U.S. 2,599,799, June 10. Ethers of polymerized epihalohydrin.

STABILIZERS. W. W. Crouch and J. F. Howe (to Phillips Petroleum). U.S. 2,599,813, June 10. Tin compounds as stabilizers for sulfur dioxide-olefin resins.

HOMOPOLYMERS. T. W. Evans and E. C. Shokal (to Shell Development). U.S. 2,599,817, June 10. Polymerization of unsaturated alcohol ethers of glycidols.

RESINS. A. A. J. Sigtermans (to Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk). U.S. 2,599,870, June 10. Phenol-aldehyde hardened with resorcinol and selenium dioxide.

POLYMERS. A. S. Carpenter and E. R. Wallsgrove (to Courtaulds). U.S. 2,599,974, June 10. Polymeric condensates of epichlorhydrin and bifunctional amino compounds.

ASPHALTIC COMPOSITION. J. Goebel, P. Bakker, and J. G. Hoogland (to Shell Development). U.S. 2,599,986, June 10. Mixtures of asphalt and polystyrene.

PLASTISOLS. A. W. Meyer and W. A. Hermonat (to U.S. Rubber). U.S. 2,600,122, June 10. Process of forming plastisols.

DENTAL COMPOSITION. F. J. Sowa and M. M. Schwartz (to M. M. Schwartz). U.S. 2,600,134, June 10. Dental impression composition of vinyl chloride-acetate copolymer, di-normal propyl phthalate, and a filler.

POLYMERS. A. E. Ardis (to B. F. Goodrich). U.S. 2,600,150, June 10. Solutions of polymers of vinylidene cyanide.

CHLOROTRIFLUOROETHYLENES. D. W. Caird (to General Electric). U.S. 2,600,202, June 10. Polymerization of chlorotrifluoroethylene.

LUBRICATED PLASTICS. J. J. Pyle (to General Electric). U.S. 2,600,321, June 10. Molded plastics containing molybdenum disulfide.

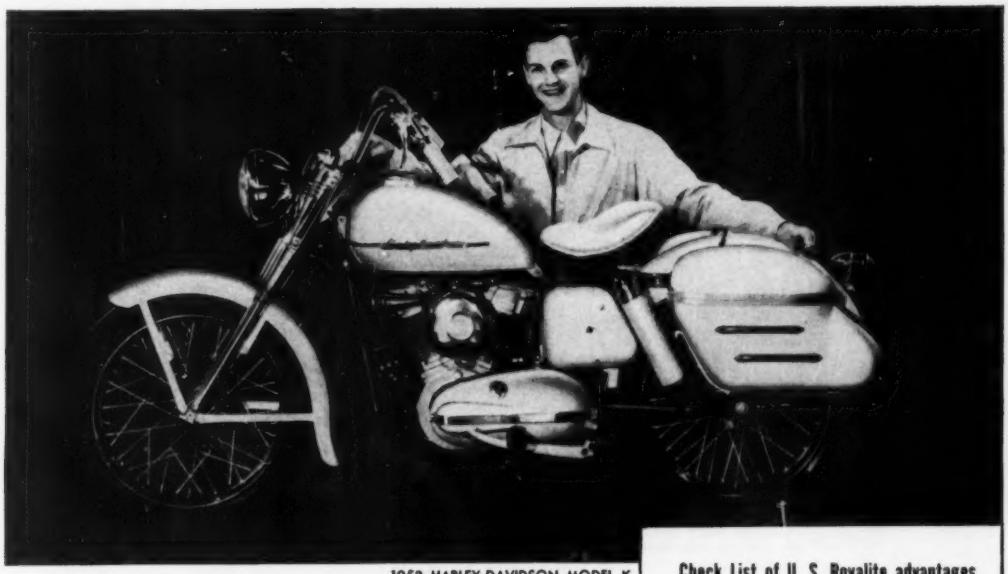
POLYESTERS. J. R. Caldwell (to Eastman Kodak). U.S. 2,600,376, June 17. Polyesters of hydroxybenzoic acids.

COPOLYMERS. L. N. Bauer, W. L. Van Horne, and H. T. Neher (to Rohm & Haas). U.S. 2,600,382-3-4-5-6, June 17. Copolymers of vinyl stearate with allyl laurate; allyl esters with methacrylic esters; vinyl esters with vinyl laurate; and vinyl laurate with maleate esters.

RESINS. M. T. Harvey (to Harvel Research). U.S. 2,600,403, June 17. Partially hydrogenated furfuraldehyde-ketone reaction products thickened under acidic conditions.

ACRYLIC RESINS. W. C. Mast, C. E. Rehberg, and C. H. Fisher (to U. S.). U.S. 2,600,414, June 17. Vulcanization of acrylic resins.

COPOLYMERS. H. T. Neher, L. N. Bauer, and W. L. Van Horne (to Rohm and Haas). U.S. 2,600,419-20-



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21-22, June 17. Copolymers of unsaturated alcohol esters; allyl esters with vinyl esters; allyl esters with acrylic esters; and maleate esters with methacrylate esters.

COPOLYMERS. W. L. Van Horne, L. N. Bauer, and H. T. Neher (to Rohm and Haas). U.S. 2,600,446-7-8-9-50-51, June 17. Copolymers of methacrylates with allyl esters; allylates with maleates; allyl esters with acrylates; maleates with acrylates; and acrylates with vinyl esters.

RESINS. J. E. Wicklatz and J. N. Short (to Phillips Petroleum). U.S. 2,600,454, June 17. Resins from 1,2-dimethylenecyclohexanes.

COPOLYMERS. J. Wynstra (to Carbide and Carbon). U.S. 2,600,457, June 17. Copolymers of fatty oil modified polyesters with vinyl monomers.

STRIP HANDLING. V. A. Rayburn (to Western Electric). U.S. 2,600,574, June 17. Device for handling plastic strip.

POLYMERS. H. E. Winberg (to Du Pont). U.S. 2,600,596, June 17. Linear polymers of aminocarboxylic acids.

ALKYD RESIN. J. H. Daniel, Jr. and J. C. Petropoulos (to American Cyanamid). U.S. 2,600,623, June 17. Modified alkyd resin reacted with styrene and an acrylonitrile.

COPOLYMERIZATION. H. F. Park (to Monsanto). U.S. 2,600,679-80, June 17. Copolymerization of conjugated dienes with unsaturated nitriles or esters.

VINYL FILMS. H. F. Park and M. J. Scott (to Monsanto). U.S. 2,600,681, June 17. Self-supporting films from polyvinyl halide latex.

COPOLYMERS. F. G. Pearson (to American Viscose). U.S. 2,600,683-4, June 17. Trifluorochloroethylene-vinyl acetate copolymers.

POLYMERIZATION. M. L. Sans (to Societe Glaces et Produits Chimiques). U.S. 2,600,695. June 17. Polymerizing vinyl chloride in gas phase.

RESINS. M. J. Scott and E. F. Jackson (to Monsanto). U.S. 2,600,698, June 17. Condensates of an aldehyde, an aminotriazine, and a mono-N-heterocyclic compound.

RESINS. F. Kohler (to Deutsche Roessler). U.S. 2,600,780, June 17.

Water-soluble highly stable urea-aldehyde condensates.

COPOLYMERS. E. L. Kropa (to American Cyanamid). U.S. 2,600,-782-3, June 17. Copolymers of dimethylstyrenes with vinyl cyclic and acyclic compounds.

POLYMERS. H. J. Passino (to M. W. Kellogg). U.S. 2,600,802, June 17. Plasticization of polytrifluorochloroethylene.

POLYMERIZATION. J. S. Rearick (to M. W. Kellogg). U.S. 2,600,804, June 17. Polymerization of trifluorochloroethylene.

POLYMERS. D. D. Reynolds and W. O. Kenyon (to Eastman Kodak). U.S. 2,600,806, June 17. Poly N-vinyl-sulfonamides.

POLYMERIZATION. J. M. Wrightson (to M. W. Kellogg). U.S. 2,600,821, June 17. Polymerizing trifluorochloroethylene.

SHOCK ABSORBER. J. G. Bush (to Vibradamp). U.S. 2,600,843, June 17. Compressible glass-fiber-resin combination.

POLYMERS. R. Aelion (to Organico). U.S. 2,600,953, June 17. Polymers from hydroxy amino acids.

MOLDING. M. M. Barton (to Consolidated Equipment). U.S. 2,600,958, June 17. Molding apparatus.

MOLDING. J. L. Amos, J. L. McCurdy, and A. W. Hanson (to Dow). U.S. 2,601,200, June 17. Production of thermoplastic molding granules.

ION EXCHANGE. W. C. Bauman and G. B. Heusted (to Dow). U.S. 2,601-202, June 17. Phenolic anion-exchangers.

SILOXANES. A. J. Barry and J. W. Gilkey (to Dow Corning). U.S. 2,-601,237, June 24. Carboxyphenyl-polysiloxanes.

COPOLYMERS. H. A. Bruson (to Industrial Rayon). U.S. 2,601,251-2-3-4-5-6, June 24. Copolymers of acrylonitrile with aminovinyl ethers; ethylene carbonate; and unsaturated sulfonic acids.

LAMINATED STRUCTURES. F. B. Ducatman and C. E. Eisenmann (to Steatite Research). U.S. 2,601,266, June 24. Method of attaching ends to cylindrical objects of resin impregnated cloth laminates.

COPOLYMERS. H. L. Gerhart (to

Pittsburgh Plate Glass). U.S. 2,601,-273, June 24. Copolymers of cyclopentadiene.

POLYMERIZATION. E. G. Howard, Jr. (to Du Pont). U.S. 2,601,293, June 24. Polymerization of vinyl compounds with a hydrazone, a peroxide, and a solution of cupric copper.

FURFURYL ALCOHOL. L. H. Brown (to Quaker Oats). U.S. 2,601,497, June 24. Furfuryl alcohol-formaldehyde resins.

PHENOL-FURFURAL RESIN. L. H. Brown (to Quaker Oats). U.S. 2,-601,498. Phenol-furfural resin made with basic catalyst and then acidified.

POLYMERS. D. Harman and A. R. Stiles (to Shell). U.S. 2,601,520, June 24. Polymers of dialkenyl alkanephosphonates.

FUEL TANK. A. M. Howald and L. S. Meyer (to Libbey-Owens-Ford). U.S. 2,601,525, June 24. Self-sealing fuel tank housing which is manufactured of glass fiber bonded laminate.

DRYING OILS. G. L. Schertz (to Hercules). U.S. 2,601,561, June 24. The resulting reaction products of polyvinyl alcohol and unsaturated fatty acids.

POLYMERS. W. M. Thomas and E.L. Kropa (to American Cyanamid). U.S. 2,601,572, June 24. Polymerizable compositions including 4-allyloxymethyl-1,3-dioxilane.

COATING FIBERS. J. H. Daniel, Jr., L. H. Wilson, R. Hastings, and C. G. Landes (to American Cyanamid). U.S. 2,601,597-8, June 24. Application of dispersed coating of an epichlorohydrin resin or a urea resin to suspensions of cellulosic fibers.

POLYESTERS. L. J. Tyler (to Dow Corning). U.S. 2,601,646, June 24. Polyesters of dicarboxyphenyldimethyl siloxane.

RESINS. G. E. Niles (to Monsanto). U.S. 2,601,665-6, June 24. Resins resulting from an amido-type compound, an aldehyde, and an amino-aliphatic sulfonic or carboxylic derivative.

LEATHER BOARD. L. H. Wilson, C. G. Landes, and C. S. Maxwell (to American Cyanamid). U.S. 2,601,671, June 24. Leather impregnated with melamine resin.

NEW MACHINERY AND EQUIPMENT

FILM PRINTER—A new hydraulic aniline printing press is suitable for treating and printing films and cellophane in a single operation. It has a continuous web control at any given speed for better color register work. Latest addition to the Wolverine Paper Converting Machinery Corp., 3545 Seven Mile Road East, Detroit 34, Mich., the Wolverine Hydro-Printer Model X-120 has a more compact drying system with greater distance between colors than other Wolverine models.

FINGER-SENSITIVE TAPPING CHUCK—The Commander Mfg. Co., 4225 W. Kinzie St., Chicago, Ill., has recently introduced a Finger Tip Control Tapping Chuck, to be used in conjunction with its Tapper, for which the company claims solution to the problem of controlling small size taps in production work. The chuck brings operator control to work level and permits the operator to "feel" the tap as it enters and leaves the work.

REDESIGNED MAGNETIC PULLEYS—Erie Mfg. Co., Erie, Pa., claims nearly 30% greater available pulling power for its redesigned 20- and 24-in. magnetic pulleys. The increased strength comes from the addition and repositioning of more Alnico V magnets.

CYLINDRICAL ABRASION TESTER—The Taber Instrument Corp., 136 Goundry St., N. Tonawanda, N.Y., has added a tester for rating abrasion resistance of black oxidized, electroplated, or other protective finishes on cylindrical parts such as gun barrels, furniture, aircraft and ordnance parts. The new model will handle test pieces ranging from ½ to 6 in. in diameter and 8 to 36 in. in length.

RADIO FREQUENCY VOLTMETER—The voltmeter indicates the amount of heat or RMS values of radio frequency voltages in dielectric heating loads that is being applied to the electrodes of a dielectric heating apparatus. Manufactured by Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa., the voltmeter requires no external power other than that from the RF voltage source. Two frequency ratings are available: 200 to 3000 kilocycles and 3 to 50 megacycles.

PLATEN PRESSES—Rodgers Hydraulic, Inc., Minneapolis 16, Minn., is currently introducing a new line of platen presses ranging from 10 to 500 ton capacities. The "Blue Ribbon Line" presses are available with square or rectangular platens, up- or down-acting, 90° angle transfer frame and top transfer. Maximum deflection for the presses is claimed to be less than 0.0005 in. per inch of span on each of the work platens. Choice is given of hand or power operated pumps, and single or double acting cylinders.

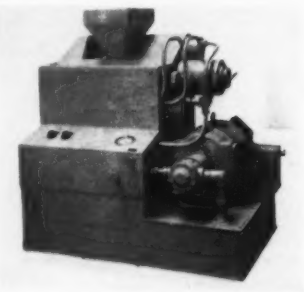
SURFACE COATING ANALYZER—H. R. Moore Co., 200 W. Montgomery Avenue, Hatboro, Pa., announces an analyzer for measurement of film properties, including: tack of non-drying resins and elastomers; gelation times of high polymers and drying oils; "consumer" drying time end points, long time conversion effects and relative surface hardness of all types of films; uniformity in fineness of grind in successive production runs of the same formula; and effect of immersion in water and other liquids at various stages of cure.

TAPPING AND DRILLING MACHINE—Development of a new electric-air-controlled tapping and drilling machine has been announced by Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y. The machine, which is designed for use with either multiple or single spindle drilling and tapping heads and is equipped with provision for interchangeable work holders, can handle a wide range of drilling and tapping requirements at high production rates.

Features of the machine (No. 74) include a patented electrically controlled 4-way valve with a built-in up and down speed control and a built-in oil pump that offers sufficient oil supply at all times. The unit can be run on a continuous automatic cycle or single stroke operation controlled by foot or hand.

HYDRAULIC PELLETER—Designed for producing standard pellets up to 3 in. in diameter, a new 35-ton horizontal hydraulic pelleter (U.S. patent applied for) has been announced by B.I.P. Engineering Ltd., Aldridge Rd., Streetly, Staffs., England. By reducing the ram stroke to the minimum requirements for compressing the powder, the pelleter can average 1200 preforms an hour. On a 2⅜ in. pellet diameter, 8 tons per sq. in. pressure can be exerted on the powder.

Since the die and hopper are left free during the pelleting stroke, thereby providing action equivalent



to having pressure on both punches instead of only on one, pellets of consistent equal density are produced. Other advantages include a minimum of powder loss; the sweeping of the edge of the die after each pelleting cycle to clear away any powder that might cake and jam the mechanism; low power consumption; the prevention of any damage to the machine because of overloading; and the ability to handle some powders not pelletable by normal means.

The pelleter stands 4½ by 3 by 5 ft. high and has a total weight of 3000 pounds.

WEIGH FEEDER—An automatic weigh-feeding unit for injection molding machines, that eliminates over-feeding, minimizes waste, and shows substantial savings in material has been announced by B. F. Gump Co.,

Model H-200

SEMI-AUTOMATIC INJECTION PRESS

2-oz. capacity. Van Dorn's engineering experience has scored again with this leader among all injection presses of its class. Its ultra-modern design insures faster operating cycles—up to 6 per minute. Push button controls are safe, simple and convenient. Accurate temperature regulation. Ruggedly built, compact and quiet.

VAN DORN

Plastic Equipment

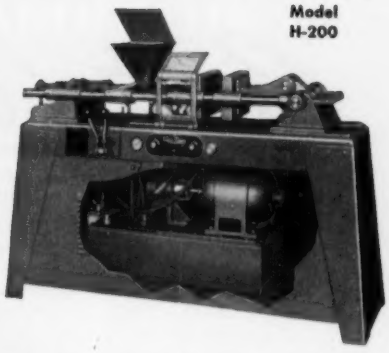
COSTS LESS to Buy...to Operate!

Van Dorn presses are *unexcelled in efficiency* and *unequalled in economy* on the innumerable jobs where a 2-oz. injection is ample. Costwise, Van Dorn presses are outstanding for these reasons:

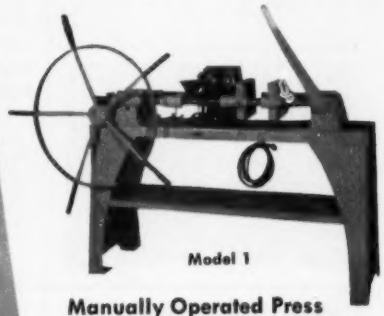
1. **Surprisingly low in price**
2. **Operate 8 hours for a few dollars**
3. **Use less expensive molds**
4. **Easily set up by one man in a few minutes**

These presses mold practically all thermoplastics including nylon . . . Look over the Van Dorn presses and plastic equipment shown—*then write for detailed Bulletins on individual machines.*

Model H-200



Power Operated, Lever Controlled Presses—Available in 2-oz. or 1-oz. models. These profit-makers feature: Rugged all-welded construction; built-in safety devices; heating chamber with ample plasticizing capacity.

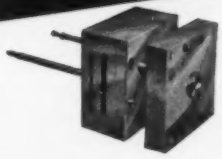


Model 1

Manually Operated Press
1-oz. capacity. Ideal for smaller jobs, experimental work, training.

Plastic Grinder
Grinds up rejects, waste, etc., for re-use. Ruggedly made, easily cleaned.

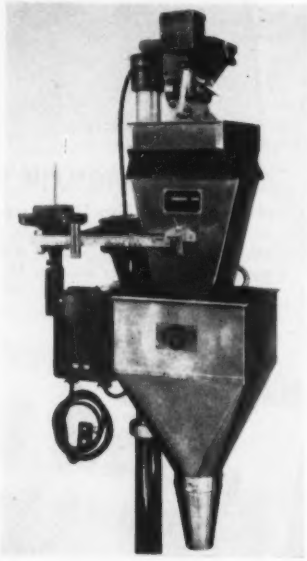
Model G-100



Mold Bases
. . . Available from stock for all Van Dorn presses.

THE Van Dorn IRON WORKS CO.
2687 EAST 79th STREET • CLEVELAND 4, OHIO
Cable Address: "VANDORN" Cleveland

Dept. C, 1313 S. Cicero Ave., Chicago 50, Ill. The unit (Series "C" Edtbauer-Duplex) consists of an even balance automatic net weigher equipped with an electrically controlled feed mechanism that synchronizes the operation of the weigher with the molding machine cycle. When the injection plunger moves back into position to receive



the charge of plastic, one charge of the exact net weight desired is automatically fed to the cylinder. The weigher then remains inactive until the next cycle, at which time the charging operation is automatically repeated. The weighing action requires only from 2 to 5 sec., depending upon the weight per charge.

Several sizes are available including the model C-1 with a capacity of 123 cu. in., or a weight range of approximately 4 oz. to 2 lb., and the model C-2 with a capacity of 280 cu. in. and a weight range of from approximately 4 oz. to 3 pounds. Larger sizes with volume capacities up to $1\frac{1}{5}$ cu. ft. may also be had, as well as a custom series capable of weighing down to 7 g. per charge with a maximum variation not in excess of ± 0.01 ounces.

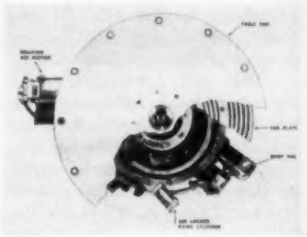
TESTING MACHINE—New testing machine that can apply a load to specimens with extremely slow speed

and is capable of being stopped instantly is in production by W. C. Dillon & Co., Inc., 1421 South Circle Ave., Forest Park, Ill. The hand-operated tester is guaranteed to within 0.5% to meet ASTM requirements.

Since the pointer will remain at peak load after the specimen breaks, the instrument, which employs a pendulum type mechanism set in machined bearings, easily provides maximum readings. Pointer is reset by releasing pendulum pawls.

The unit is available with four grip clearances—14¾; 24; 36; and 48 in.—and is calibrated with four individual scales—10 lb. range with ½ lb. divisions; 25 lb. range with 1 lb. divisions; 50 lb. range with 2 lb. divisions; and 100 lb. range with 5 lb. divisions. Over-all height is 64 in.; net weight is 170 pounds.

ROTARY INDEX TABLE—An electrically controlled, air powered, rotary index work feeder that accurately positions work has been added to the line currently being manufactured by The Bellows Co., 230 W. Market



St., Akron 9, Ohio. The rotary index table (BRET-26) has a 26 in. diameter table top rotated by a 3⅝ in. air motor with full electrical control. The table is set to index either 6, 9, or 18 stations with a repeat index accuracy of ± 0.001.

Primarily responsible for this accuracy is a "shot-pin" arrangement consisting of 18 equally spaced, jig-bored holes, tapered and bushed to ¾ in. diameter and located around the perimeter of the table top. An air cylinder synchronized to the movement of the table drives a tapered shot-pin into the jig-bored hole, locking the table in position.

Fixtures can be mounted directly to the table top or to a second table top, which can then be mounted on the standard table top.

BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"American Handbook of Synthetic Textiles," edited by Herbert R. Mauersberger.

Published in 1952 by Textile Book Publishers, Inc., 303 Fifth Ave., New York 16, N. Y. 1216 pages. Price $10.80

A survey of present-day synthetic fibers as to historical background, manufacture, properties, and finishes is presented in this illustrated handbook. Included among the synthetic fibers covered are cellulosics, nylon, Vinyon N, Dynel, Orlon, Dacron, and saran. Chapters are devoted to processing of synthetic staple; winding, coning, and filling preparation; warping and warp sizing; throwing and twisting; weaving; dyeing; identification of synthetic fibers by x-ray diffraction; and the preparation and manufacture of knit goods. A bibliography and literature references are also included.

"Technical Data on Plastics."

Published in 1952 by the Plastic Materials Mfrs. Assoc., Inc., Tower Bldg., 14 and K Sts., Washington 5, D.C. 141 pages. Price $2.50.

This data book is intended as a technical aid to the industry and to the representatives of government agencies concerned with the use of plastics materials. Each of the various materials is cataloged as to measured properties and as to the variables affecting such properties. Where a characteristic deserves special emphasis, tables and graphs are used. The materials covered include urea formaldehyde; melamine formaldehyde; phenolic; polyester; acrylic; polyethylene; polyvinyl formal; vinyl chloride; polystyrene; cellulose acetate; cellulose nitrate; and nylon.

"Forest Products Research Guide."

Published in 1952 by the National Lumber Mfrs. Assoc., 1319 18 St., N.W., Washington 6, D.C. Price $10.00.

As a means of avoiding unnecessary duplication and as a guide for those interested in the lumber field, more than 17,000 research projects being conducted by nearly 3000 domestic and foreign organizations on wood and other forest products are cataloged in this comprehensive directory.

Swivel joints—Photographs and sketches demonstrate the advantages and characteristics of the company's high pressure hydraulic swivel joints in this 4-page bulletin (No. 269). Standard dimensions and specifications are listed for each of the four different styles of joints designed for ¼, ⅜, ½, and ⅝ in. o.d. tubing. *Barco Mfg. Co., Dept. J-21, 1801 Winnemac Ave., Chicago 40, Ill.*

Thermocouple catalog—An illustrated 44-page catalog (No. EN-S2) offers information on available couples and couple assemblies for general applications. Included also is an expanded section on special couples for plant and laboratory, which covers applications for open-hearth, glass feeder, pickling acid, steam plant, and blast furnace installations. Component parts of couple assemblies are fully described and illustrated. *Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.*

Heat seal emulsions—Technical data sheet covering ARCCO heat seal emulsions discusses their use in heat bonding various combinations of papers, cloths, leathers, metal foils, plastic films, and other surfaces. *American Resinous Chemicals Corp., 103 Foster St., Peabody, Mass.*

Shell molding—A survey of the shell molding process and the latest developments in the field are offered in this 28-page manual. The material included covers a synopsis and review of the shell molding process; equipment requirements; material requirements—subdivided into sand and thermosetting binders; release or parting agents; practical considerations of shell molding; and the process limitations involved. *Monsanto Chemical Co., Plastics Div., Springfield 2, Mass.*

Dow latex 744-B—Technical data on the properties of Dow latex 744-B for latex paint are contained in this 8-page bulletin. Types of alkyds used, methods of preparation, pigmentation, thickeners, and pigment dispersants are covered. *The Dow Chemical Co., Plastics Dept., Midland, Mich.*

Styrene modified natural oils—Intended as a guide to the styrenation of other natural oils, such as linseed, soya, and tung, to be used in the formulation of surface coatings, this 4-page report offers technical information on a styrenated dehydrated castor oil. Included are formulation, evaluation data and properties, enamel properties, uses, and literature and patent references. *Monsanto Chemical Co., Texas Div., Texas City, Texas.*

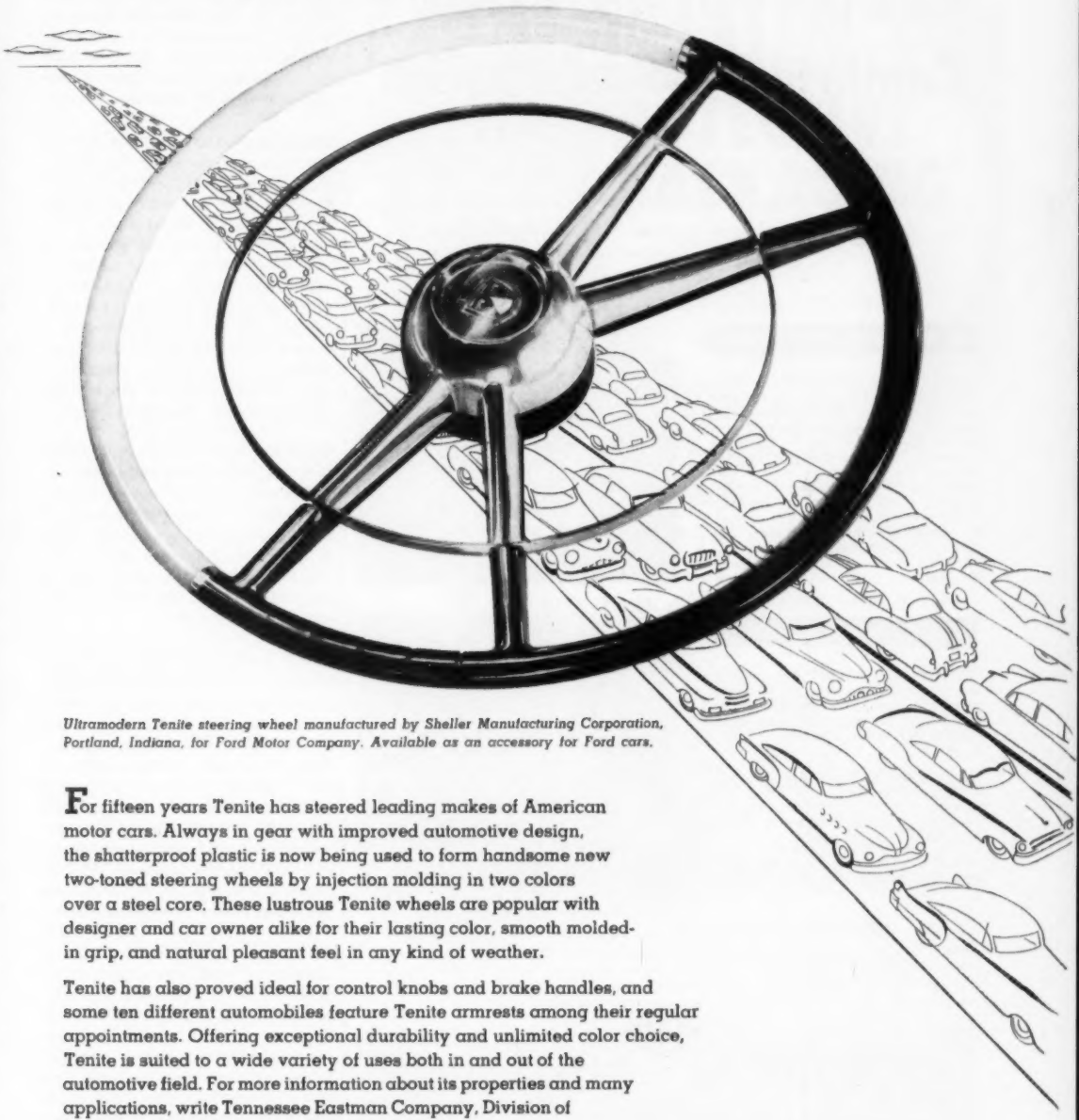
Printed circuits—Developments of the company in the field of printed circuits are described in this 4-page brochure. Advantages of printed circuits in many types of electrical and electronic production, plus details on reduction in size and weight, easier maintenance, and improved reliability, are discussed. *The Formica Co., 4614 Spring Grove Ave., Cincinnati 32, Ohio.*

Testing machines—Data on the company's line of Universal testing machines is given in this bulletin (No. 43). Description of the pendulum lever weighing system, mechanical or hydraulic loading systems, electronic recorder, and strain instruments is offered. Also listed are specifications, installations, tools and accessories, and proving rings. *Tinius Olsen Testing Machine Co., 1068 Easton Road, Willow Grove, Pa.*

Vinsol—Advantages of using Vinsol air-entraining agent in concrete, and the methods employed in its production, are described in this leaflet. A list of suppliers of solutions of neutralized Vinsol is also included. *Hercules Powder Co., Naval Stores Dept., Wilmington 99, Del.*

Resin review—Fourth in a series of booklets published by the company for the users of synthetic resins, this issue covers such topics as Monoplex

steering millions of cars



Ultramodern Tenite steering wheel manufactured by Sheller Manufacturing Corporation, Portland, Indiana, for Ford Motor Company. Available as an accessory for Ford cars.

For fifteen years Tenite has steered leading makes of American motor cars. Always in gear with improved automotive design, the shatterproof plastic is now being used to form handsome new two-toned steering wheels by injection molding in two colors over a steel core. These lustrous Tenite wheels are popular with designer and car owner alike for their lasting color, smooth molded-in grip, and natural pleasant feel in any kind of weather.

Tenite has also proved ideal for control knobs and brake handles, and some ten different automobiles feature Tenite armrests among their regular appointments. Offering exceptional durability and unlimited color choice, Tenite is suited to a wide variety of uses both in and out of the automotive field. For more information about its properties and many applications, write Tennessee Eastman Company, Division of Eastman Kodak Company, Kingsport, Tennessee.

TENITE

an Eastman plastic

Information regarding Tenite is also obtainable through representatives located in Chicago, Cleveland, Dayton, Detroit, Houston, Leominster (Mass.), Los Angeles, New York, Portland (Ore.), Rochester (N. Y.), St. Louis, San Francisco, and Seattle; and elsewhere throughout the world from Eastman Kodak Company affiliates and distributors.

S-38; the Clash-Berg torsional method; plywood adhesives; liquid resin glues; and Amberlite ion exchange. The booklet is illustrated with tables, graphs, and diagrams. *Rohm & Haas Co., Resinous Products Div., Washington Square, Philadelphia 5, Pa.*

Plasticizers—The complete line of plasticizers produced by the company are described in this 14-page booklet, with a special illustrated section covering the uses and properties of ten individual plasticizers in more detail. Two other sections of the booklet are devoted to a survey of the growth of the industry and to the story behind the development of the company as a producer of plasticizers. *Plasticizer Div., Pittsburgh Coke & Chemical Co., Room 1940, Grant Building, Pittsburgh 19, Pa.*

Bonding shell molds—Assembling shell molds by gluing is described in this leaflet. Included are directions for mixing and using the company's shell paste TP-22, a synthetic resin in powder form, plus Accelerator TA-102, as a bonding agent. *Borden Co., Chemical Div., 350 Madison Ave., New York 17, N. Y.*

Sheet fabrication—The personnel, material, and equipment set-ups required by a manufacturer interested in the fabrication of copolymer sheet is detailed in this 25-page booklet, "How to become a Boltaron fabricator." Included are the requirements as to space, molds, molding and forming equipment, finishing equipment, labor, and promotional material. Photographs illustrate the machines and equipment in actual operation. *Bolta, Lawrence, Mass.*

Wet blasting—Applications of wet blasting to work where close tolerances must be maintained are described in this 6-page brochure. Included are die and mold finishing, die and mold maintenance, tool finishing and deburring, and heat treat scale removal. The brochure is illustrated with photos of parts both before and after wet blasting. *American Wheelabrator & Equipment Corp., Mishawaka, Ind.*

O-rings—Design, manufacture, and application of O-rings as static and dynamic seals are described in this 16-page brochure. Groove machining details for both applications with

and without back-up washers or non-extrusion washers are presented in chart form. Also included in the booklet is a ready-reference chart showing the company's packing compounds as they correspond with the A.S.T.M. and A.M.S. specifications. *International Packings Corp., Bristol, N. H.*

Preform machines—Specifications on three different sizes of preform machines are offered in this 4-page illustrated brochure. The three sizes covered include the company's standard 28 in. diameter, the special 48 in. diameter, and the special 72 in. diameter. *Turner Machine Co., Inc., Danbury, Conn.*

Aniline black—A variety of methods for producing aniline blacks, together with the advantages and disadvantages of each, are presented in this 10-page technical bulletin. Included are recipes for the formulation of nitro-acetate aniline black; lead chromate black; copper sulphide black; diphenyl black; prussiate black; resist printed styles; and copper black. A short description of the aniline blacks as to uses, fastness, drying, aging, and washing is also given. *American Cyanamid Co., Calco Chemical Div., Bound Brook, N. J.*

Industrial insulations—Insulating materials which cover the complete temperature range from 150° F. to 1800° F., are described in this 20-page illustrated catalog. Features, applications, uses, sizes, packaging, and densities are included for the various products, among which are insulating cement, blocks, blankets, felt, and pipe coverings. Properties are illustrated with thermal-conductivity graphs and heat-loss charts. *Baldwin-Hill Co., 1140 Breunig Ave., Trenton, N. J.*

Window glazing—Intended for use by plant maintenance engineers, architects, and others confronted with frequent breakage of windows or costly glazing problems, this 16-page illustrated booklet offers detailed information on glazing industrial and other buildings with flat panels of Plexiglas acrylic. The booklet lists the behavior and properties of Plexiglas and includes in tabular form the percentages of solar heat and visible light trans-

mitted and the recommended thicknesses for glazing of various sizes, Twelve detailed drawings are used to illustrate the installation of the Plexiglas in wood and metal sash. *Rohm & Haas Co., Plastics Dept., Washington Square, Philadelphia 5, Pa.*

Wire and cable—More than 500 different types of wires and cables are described in this 186-page general catalog. Included are comprehensive data on construction and operating characteristics for such products as control and signal cables, railroad wire and cables, mine cables, and portable cords. A detailed technical engineering data section is also included. *United States Rubber Co., Att: Mr. R. H. Turner, Rockefeller Center, New York, N. Y.*

Government procurement manual—Designed to aid manufacturers in obtaining government business, this 16-page booklet covers all the aspects of the procurement picture. Topics covered include financing defense contracts; conversion to military production; bidding; and the common difficulties encountered in government procurement. *Trilane Publications, Inc., 1 Hudson St., New York 13, N. Y.*

Silicone rubber—A comprehensive review of the properties and performance of the company's silicone rubber is presented in the house organ, "Silastic Facts," (No. 10A). Separate sections are devoted to a discussion of the resistance of these semi-organic elastomers to high and low temperature, weathering, chemicals and hot oils, and to their compression set, thermal aging, and dielectric properties. A chart summarizes the physical characteristics of 22 leading stocks. Typical applications, including gaskets, seals, mechanical parts, and hoses are also described and illustrated. *Dow-Corning Corp., Midland, Mich.*

Casting with Laminac resins—Advantages and possible applications of cast Laminac resins are included in this 11-page booklet which covers resins, accelerators and catalysts, heat of reaction and cracking, fillers, cure temperature, molds, and storage stability and catalyzed life. Special attention is given to a detailed discussion of the properties of Laminac resins 4116; 75% Laminac resin

4116; 25% Laminac resin 4134; and Laminac resin 4150. *American Cyanamid Co., Plastics and Resins Div., 30 Rockefeller Plaza, New York 20, N. Y.*

Far infra-red panels—Dimensions, rating, and intensity controls of the company's electric radiant panels are listed in this 6-page specification booklet (No. CS-605). Typical applications of the panel are outlined and illustrated for several industries, including plastics; metals; glass; ceramic; food; electrical; foundry; textiles; and paper and printing. *Edwin L. Wiegand Co., 7503 Thomas Blvd., Pittsburgh 8, Pa.*

Silicone rubber—Intended for use by designers, purchasing agents, and engineers, this 24-page bulletin (CDS-3) offers a summary of information on silicone rubber. The book is divided into three sections—properties and applications of silicone rubber; available classes; and design specifications. Charts and tables are presented, and photographs of actual applications illustrate the booklet. *General Electric, Chemical Div., Pittsfield, Mass.*

Cooling towers—Information on the company's cooling towers is presented in this 36-page catalog. Included is a discussion of the construction of the tower with special attention to such component parts as the fan drive; equipment support; floating shaft; speed reducer; distribution system; fan; casing; and framing. The catalog also contains suggestions regarding recirculation and surroundings. An "Inquiry Data Sheet" outlines the information to be given by a company for planning specific requirements. *Foster-Wheeler Corp., 165 Broadway, New York 6, N. Y.*

CORRECTION

We have just been informed by Durez Plastics & Chemicals, Inc., North Tonawanda, New York, that the arm rests on the deck chairs which are used on the superliner *United States* are of molded phenolic rather than of high pressure laminate as is stated on page 164 of our September 1952 issue.

The deck chairs themselves are made by Barcalo Manufacturing Company; the arm rests are molded by Norton Laboratories.

How the textile industry benefits from SHOCK-RESISTANT G-E RUBBER-PHENOLICS

Textile equipment parts like these are now stronger and longer-lasting, thanks to G-E rubber-phenolic molding materials. (Cheese core barrel in foreground molded by Barber-Colman Co. Cones and tube molded by Jacobus Plastics Co.)

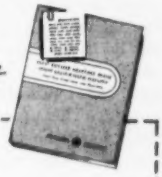
For plastics parts that must stand up under extra-heavy-duty conditions, specify General Electric rubber-phenolics!

For example, in the textile industry, rubber-phenolic compounds are being used (instead of wood) for bobbins, tubes, pirns and other molded parts requiring exceptional shock resistance. Here are some of the advantages these new plastics materials provide:

1. **Long life**
2. **Uniform weight**
3. **Light weight**
4. **High operating efficiency**

All of which means LOWER COSTS.

Investigate G-E rubber-phenolics! These remarkable compounds offer *five times* the shock resistance of ordinary impact-grade plastics. Use coupon below for free booklet with more details.



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INTERNATIONAL PLASTICS NEWS*

Activities Around the World of Interest and Importance to the Plastics Industry in the United States

Holland Exports—A new export organization for the Netherlands has been established under the name of Exoplastics, with offices at Jacob Mosselstraat 5, The Hague, Holland.

This group has been formed by the Netherlands Association of Plastics Manufacturers, which represents about 90% of the compression and injection molding industry in that country. Exoplastics will appoint agents or representatives throughout the world to extend the export business of members of the Association.

Russian Journals—Complete English translations of certain Soviet chemical journals are available through Consultants Bureau, 152 West 42nd Street, New York 18, N.Y. These translations bring to interested Americans the complete text, with tabular material, graphs, photographs, etc., of the following Soviet publications: *The Journal of General Chemistry of the USSR, Journal of Applied Chemistry of the USSR, The Journal of Analytical Chemistry of the USSR, Bulletin of the Academy of Sciences of the USSR, Division of Chemical Science, Colloid Journal and Progress of Chemistry.*

Isocyanate Chemistry—One of the special attractions at the Dusseldorf Plastics Fair—October 11-19, 1952—will be the development of the so-called isocyanate chemistry which holds great promise to the plastics industry. This process for producing plastics will be shown for the first time on a large scale and in a comprehensive manner.

In essence, isocyanate chemistry involves the so-called polyaddition process as distinguished from polycondensation and polymerization.

The new polyurethanes produced by isocyanate chemistry are reported to be extremely versatile. They can be produced in the form of filaments which can be spun, as injection molding materials, as the basis for enamels and other surface finishes, and as highly elastomeric materials with new and unusual combinations of properties.

In addition, these materials can be produced in expanded form for light weight constructions, both rigid and flexible.

The Fair at which these new materials will be displayed—"Plastics 1952"—will be held concurrently with a Convention at which papers will be presented on the economic problems of the plastics industry, the chemistry of plastics, and problems relating to the application of all types of plastics materials.

British Competition—The council of the British Plastics Federation has announced that prizes of up to £150 will be awarded for papers on original investigations in engineering and/or physical problems of compression, transfer, or injection molding. The prizes, from the Bowen (Cables and Plastics) Prize Fund, will be awarded for papers presented before the Plastics Institute or its branches, the Plastics and Polymer Group of the Society of Chemical Industry, the Convention held in connection with the British Plastics Exhibition in June 1953, or submitted direct by an author.

Papers for this competition must be in the hands of the General Manager of the British Plastics Federation by Friday, July 31, 1953. Headquarters of the Federation is at 47/48 Piccadilly, London, W.1, England.

Achema X Exhibition—Results of the Achema X Exhibition of chemical equipment which took place in Frankfurt am Main earlier this year were highly encouraging, according to reports received from the backers of the Exhibition. Some 5000 exhibits were shown by 575 manufacturers and some 8000 experts from 28 different countries registered for participation in the Convention.

The purpose of Achema is that of furthering the development of chemical apparatus, materials, and equipment by the exchange of ideas between manufacturers and users. The freedom with which development work was revealed in the 1952 Exhibit showed plainly that the basic idea is becoming accepted more and more throughout the world.

Definite steps will be taken late in 1952 for the planning of the next Exhibit and for the determination of the year in which it will be held.

The address of Achema is Frankfurt am Main, 13, Postfach, Germany.

Color in Mexico—It has recently been announced by the Kreiger Color & Chemical Co., Inc., Hollywood, Calif., that E. Uhthoff y Cia., 168 Zacatecas St., Mexico City, D. F. has been appointed to represent Kreiger as a distributor of plastics colorants. These materials include Kreiger dry colorant for styrene polymers and copolymers and for polyethylene and polyesters.

President of the distributing company, Mr. E. Uhthoff, is also president of Monsanto Mexicana.

Glass Yacht—Tests are now being conducted on a prototype 16-ft. yacht built by the N.E. Coast Yacht Building & Engineering Co., Ltd., at Blythe, Scotland.

The entire hull of the yacht is a reinforced plastics molding made of fibrous glass mat and a polyester resin. The only metal in the boat is reported to be in the fin, the keel, and conventional cleats. The open cockpit type hull has two water-tight bulkheads fore and aft. The hull thickness is ⅛-in.; the floor is thickened to ¾-in. to take keel stresses. Total displacement is less than 500 lb., sail area is 150 sq. feet.

One of the features of this new boat is that it incorporates a hollow reinforced-plastic mast and boom.

Plastics in India—Periodic reversals in the plastics business in India are often baffling to foreign suppliers of raw materials. In an attempt to present the reasons for these fluctuations, H. N. Patels, Commercial Manager of Bakelite (India) Limited, has prepared an article surveying the entire Indian plastics industry. This article is available in reprint form from Technical Press Publications, C 19, Sitaram Buildings, Hornby Road, Bombay-1, India, or 24-7, High Holborn, London, W.C. 1, England.

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Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant for transfer to other plants

PLASTICS AND SYNTHETIC RESIN PRODUCTION
From Statistics Compiled

Materials	*Total p'd'n. first 6 mos. 1952*	*Total sales first 6 mos. 1952*
CELLULOSE PLASTICS:[a]		
Cellulose acetate and mixed ester plastics:		
Sheets, under 0.003 gage	5,084,281	4,970,982
0.003 gage and over	4,264,923	4,239,266
All other sheets, rods, and tubes	2,754,571	2,579,514
Molding, extrusion materials	25,713,008	25,464,599
Nitrocellulose:		
Sheets	2,590,429	2,241,028
Rods and tubes	382,842	457,317
Other cellulose plastics[b]	4,049,930	3,747,405
PHENOLIC AND OTHER TAR ACID RESINS:		
Laminating	30,932,066	20,450,335
Adhesive	19,200,242	17,911,941
Molding and casting materials[a]	80,510,007	68,488,875
Protective coatings, modified and modified except by rosin)	13,076,426	11,455,996
Miscellaneous uses	29,968,207	27,647,155
UREA AND MELAMINE RESINS:		
Adhesives	38,051,805	37,491,280
Textile-treating resins	16,161,212	15,160,333
Paper-treating resins	10,639,304	10,186,794
Protective coatings, modified and unmodified	10,630,831	8,615,671
Miscellaneous uses, including laminating and molding[c]	26,034,149	27,799,565
STYRENE RESINS:		
Molding materials[a]	122,876,796	100,221,683
Protective coatings, modified and unmodified	30,999,991	33,320,455
Miscellaneous uses	32,326,693	26,656,998
VINYL RESINS:[d] Total	219,227,741	189,582,824
Sheeting and film (resin content)[e]		76,366,621
Adhesives (resin content)		7,372,745
Textile and paper-treating resins (resin content)[f]		19,906,289
Molding and extrusion materials (resin content)		65,754,111
Protective coatings (resin content)		8,834,870
Miscellaneous uses (resin content)		13,348,188
COUMARONE-INDENE AND PETROLEUM POLYMER RESINS:	85,269,271	85,307,885
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:		
Molding materials[a,g]	49,800,221	47,976,879
Protective coatings[h]	30,674,722	30,396,512
All other uses[i]	47,737,737	45,936,002

[a] Dry basis is designated unless otherwise specified. [b] Includes fillers, plasticizers, and extenders. [b] Includes sheets, rods, and tubes, and molding and extrusion materials. [c] Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. [d] Production statistics by uses are not representative, as end-use may not be known at the time of manufacture. Therefore, only statistics on total produc-

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

IN POUNDS[a] FOR MAY, 1952, AND JUNE, 1952
by U. S. Tariff Commission

May 1952		*June 1952*	
Production	*Sales*	*Production*	*Sales*
634,861	735,617	649,152	683,469
758,060	723,894	654,469	688,788
377,463	425,462	409,602	388,239
4,121,916	4,188,380	3,804,780	3,934,311
429,388	326,160	382,540	322,048
55,690	58,154	70,789	84,637
657,474	632,805	399,624	484,420
4,849,098	3,496,898	5,198,199	3,268,735
2,987,506	3,155,059	3,130,435	2,971,323
11,478,165	10,416,343	11,314,546	9,402,965
1,674,200	1,746,856	2,016,411	1,720,541
4,694,013	4,853,189	5,183,399	4,895,114
6,521,733	6,822,842	6,797,825	6,255,528
2,474,663	2,376,616	2,462,865	2,069,814
1,669,570	2,031,535	2,078,813	1,704,897
1,734,710	1,509,668	1,924,459	1,404,933
4,289,401	4,683,962	3,972,322	4,484,143
19,021,385	16,329,549	20,532,164	16,513,415
5,892,565	6,529,169	6,012,788	6,238,292
4,937,722	5,186,901	5,880,919	4,874,753
31,896,966	29,810,262	29,357,245	27,204,766
	11,992,726		10,015,354
	1,327,824		1,378,865
	3,388,154		3,302,987
	9,289,105		8,739,042
	1,539,425		1,594,180
	2,273,028		2,174,338
14,774,281	15,397,590	13,538,371	13,473,890
9,030,831	9,111,178	8,299,665	6,832,121
2,078,812	2,139,771	2,265,281	2,303,653
8,309,711	8,374,347	9,166,965	8,197,176

tion are given. [a] Prior to January 1951, statistics were given on the basis of total weight. [f] Includes data for spreader and calendering-type resins. [g] Includes data for acrylic, polyethylene, nylon, and others. [h] Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective coating resins. [i] Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

Battery Case

DURABILITY and light weight—prime requisites for the photography enthusiast's equipment—are embodied in a flash unit battery case fabricated from 0.125 in. thick Boltaron copolymer sheet supplied by Bolta Products Sales, Inc., Lawrence, Mass. The case is manufactured by the Gregstrom Corp., Cambridge, Mass. and is used by the Cellux Electronic Corp., Boston, Mass., in their Cellux photographic flash unit as a protective housing for the batteries that supply power for the "flash."

The case, complete with an adjustable shoulder carrying strap and loaded with batteries, weighs only 4 lb., 8 oz.; the lamp assembly which attaches to the camera weighs only

Sturdy, lightweight flash unit battery case fabricated from copolymer sheet

14 ounces. The entire unit can thus be easily carried about by the photographer to provide a quickly available source of light without the use of conventional flash bulbs.

The copolymer sheet's resistance to impact and abrasion is a further asset to the photographer whose picture taking activities may require a large degree of rough handling. It is, at the same time, waterproof, stainproof, mildew proof, and grease proof; it may be readily washed, as frequently as desired, using only soap and water as a cleaning agent.

The case, finished in a sandblast effect, is kidney shaped so that the curves fit snugly against the body as it hangs from the shoulder-strap. It is available only in tan.

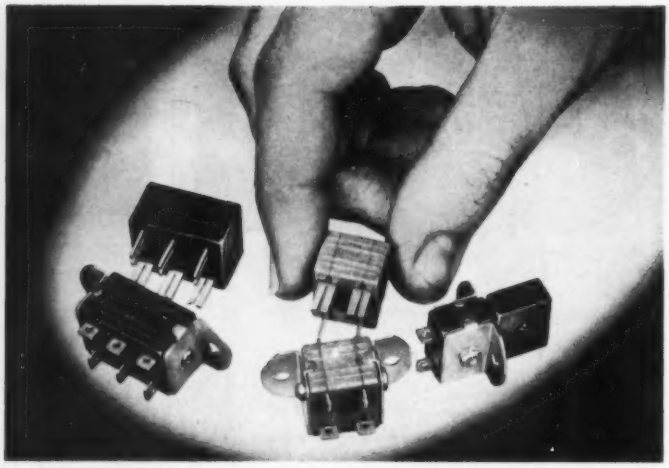
Publisher Honored

THE Order of Orange-Nassau with the rank of Officer was recently conferred upon Charles A. Breskin, publisher of MODERN PLASTICS, by Baron J. A. de Vos van Steenwijk, Consul General of the Netherlands. This high honor was awarded at the direction of Queen Juliana in recognition of Mr. Breskin's aid to the people of the Netherlands in rebuilding their economy and commerce in the years following World War II.

In that period Mr. Breskin placed himself at the disposal of the Netherlands Trade Commission in counseling Dutch industry on the latest techniques of modern high-speed mass packaging of consumer and industrial products as currently practiced in the United States. His subsequent activities included a series of addresses in leading cities throughout Holland, the preparation of special exhibits of American designed packages at industrial expositions in that country, and the direction of numerous packaging seminars attended by leading Netherlands manufacturers.

Mr. Breskin is founder and publisher of *Modern Packaging* magazine, the largest publication devoted solely to that subject. Other Breskin publications are MODERN PLASTICS magazine, "Modern Plastics Encyclopedia," and "Modern Packaging Encyclopedia."

Baron van Steenwijk
Publisher Charles A. Breskin



Miniature electrical connectors molded of phenolic are easily assembled to form male and female variations or combinations that are multiplied with the number of contacts

Miniature Electrical Connectors

USING only four basic components, miniature electrical connectors called Varicons can be assembled into male and female units with any required number of contacts. The basic components consist of three body sections molded of Durez phenolic to provide high strength and dielectric properties, plus a single type of metal contact.

Produced by Elco Corp., Philadelphia, Pa., the connectors can be furnished assembled or can be put together by the user to suit requirements. Stocking only the four basic components, the user can produce finished connectors on a mass production basis and yet make changes in the number of contacts or the polarity of any connector as needed.

Three body sections and metal contact form basic components of connectors

Male or female connectors are only a matter of assembly since the components for each are identical. The number of contact variations or combinations multiplies with the number of contacts used.

Contacts are rotated 90° between male and female connectors so that the longitudinal slots mesh and provide positive contact along their length. In assembly, the metal contacts are sandwiched between the phenolic body sections. The combinations or multiples of the sections used provide the keying variations and flexibility which are unique features of this connector system.

In addition to their conventional applications, the small size and polarity control features of these connectors make them useful in chassis circuits, on lines and cables in plug-in circuit elements, and for internal as well as external connections of appliances or electrical equipment.

Varicons are rated at 30 amps. at 110 volts and can withstand 4000 volts between closest terminals. Capacitance is negligible. Contact resistance is 0.0001 ohms and contact spacing is suitable for 300 ohm lines. The metal contacts are made of silver plated brass, phosphor bronze, or beryllium copper.

Polyethylene dispensing tubes for cheese have patterned styrene closures

Food in Tubes

COLLAPSIBLE tubes of polyethylene are replacing conventional tin tubes for packaging cocktail cheese spreads. The result is a more attractive, more economical, more efficient container-dispenser.

The plastic tubes, manufactured by Sue Ann Food Products Corp., Chicago, Ill., are light in weight, durable, pleasant to the touch, and require no refrigeration in shipment or storage. They are completely inert and odorless and may be used in direct contact with delicate food products without contamination.

From a display and customer use standpoint, the polyethylene tubes, unlike the frequently twisted or flattened tin tubes, are virtually dent-proof and retain their neat appearance until empty. Since the polyethylene tubes return to their original shape after squeezing out some of the contents, the food which ordinarily would remain in the dispensing nozzle will be sucked back.

The seamless tubes are blown by Elmer E. Mills Corp., Chicago, Ill., and are supplied with the bottom open. After the filling operation, the bottom is crimped and heat sealed.

The tube measures 5¾ in. long, including a styrene closure that is available with four different shapes of openings for squeezing the cheese into different decorative patterns. Wall thickness is approximately 1/32 in. and the outside diameter is just over 1⅛ inches. The tube is blown with a sloping shoulder and a threaded opening for the styrene cap.

Awning consisting of removable colored styrene panels held in position in slots in an aluminum frame is light in weight, easily installed, and adjustable as to slope

Styrene-Paneled Awning

A PERMANENT plastic-paneled, metal framed awning called Plastic Dome is being made by Reverso Products Co., Brooklyn, N. Y. The light-filtering, removable plastic panels, 5½ in. wide, in red and green colors, are inserted in slots in an adjustable, light-weight steel-supported aluminum frame.

Made from 0.020-in. thick oriented styrene extruded by Plax Corp., Hartford, Conn., using Koppers material, the panels have excellent heat resistance and dimensional stability. The material contains no plasticizer and hence can not curl, harden, or crack because of plasticizer loss.

Removable panels may be changed to harmonize with new colors on the house

According to the manufacturer, the awning can be assembled, bolted together, and attached to the house by means of screws in 30 minutes. Plastic Dome has hidden steel supports, with baked-on, weather-resistant enamel. It is ventilated with rear fringe and side vents and has adjustments for changing the slope.

Weather tests indicate that the new plastic and metal unit will withstand a variety of severe weather conditions.

This development resulted from an effort to produce an all-year awning that need never be taken down. All-metal types, while superior to fabric units, keep out sunlight during seasons when it is wanted. The styrene panels have the effect of plastic venetian blinds in that they permit diffused light to enter windows yet keep out direct sunlight and glare.

Another advantage of Plastic Dome is that the removable panels may be changed to harmonize with new colors on the house. A range of standard sizes is expected to cover 90% of all possible installations.

Bus-Bar Barriers

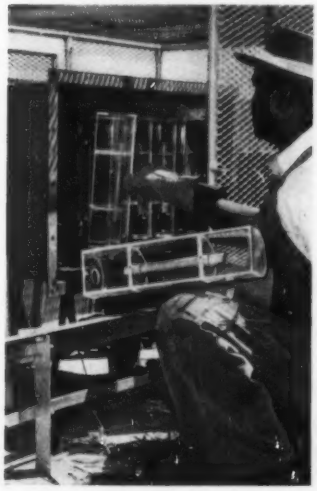
HIGH-VOLTAGE barriers formed from clear acrylic sheets by Jackson Metal & Plastics Co., Jacksonville, Fla., are used to protect bus-bar connectors in the sectionalizing boxes that service airport approach lighting systems. The semi-cylindrical Plexiglas tubes are mounted over copper bus bars one in. in diameter by 10 in. long.

The dielectric properties of the acrylic barrier prevent the electric field of each bus bar in a box from crossing into the field of the adjacent and similarly mounted connector. Because of this, the acrylic barrier permits the bus bars to be mounted in the sectionalizing boxes on center lines only 3 in. apart even though 4160 volts pass through each box.

In addition to its dielectric properties, the acrylic shield has low moisture absorption and is corrosion-resistant, which makes it ideal for outdoor use under all atmospheric conditions. Most important of all is the transparent quality which allows visual inspection when checking for line failure without the necessity of de-energizing the line.

Acrylic fabrication methods—heating, forming, and solvent cementing—permit production of these barriers without the use of molds or dies.

Acrylic bus-bar barriers have cemented-on handles for easy removal from boxes



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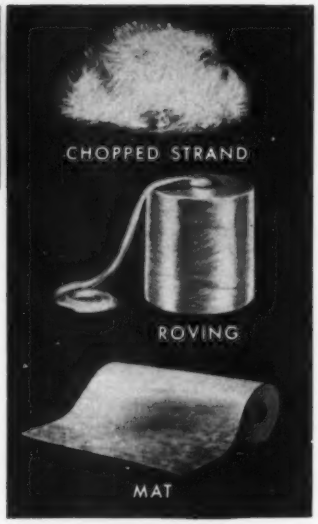

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Ceiling of public lounge room of a large department store is covered with new fibrous glass, vinyl faced acoustical tile. Noise is controlled; vinyl face is easy to clean

Fibrous Glass Tile

VINYL-faced Fiberglas acoustical tile without surface perforations has been developed by Owens-Corning Fiberglas Corp., Toledo, Ohio, as a ceiling and wall covering for kitchens, dining rooms, lounges, and other public rooms where sound control and reduced maintenance are desirable. The vinyl facing acts as a drumhead and transmits sound by vibration into the tile. Millions of tiny cells formed by the fine fibers of glass in the tile trap the sound waves as they are transmitted by the vinyl drumhead and thus reduce noise.

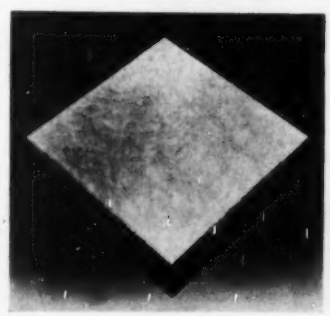
The vinyl membrane is a film about 1.5 mils thick which is stretched across the face of the Fiberglas tile. For field tile which does not have to be cut before setting in place, the film is cemented along the edges of the tile with an adhesive. For tile that must be scribed and cut, as for border work, the film is cemented across the entire face of the tile.

Choice of vinyl film for the membrane was conditioned by two factors: 1) it is within a favorable price range; 2) it does not support combustion and therefore, from the point of view of fire safety, is an excellent material to use in combination with Fiberglas tile which is itself non-combustible.

Maintenance is an easy matter because the tile has low moisture absorption properties and there are no perforations or surface openings in which grease or dirt can lodge. The tile is simply washed or scrubbed. Ease of cleaning is the advantage that membrane-faced tile has over conventional Fiberglas tile used for the same purpose. Bare acoustical tile has comparable sound absorption qualities but its perforated and textured surface attracts dirt.

The new tile is currently available in gray mother-of-pearl, but a range of colors and designs is expected soon.

Decorative vinyl film is stretched over fibrous glass tile, cemented in place



Crack Detection

A METHOD for finding surface cracks in nonmagnetizable materials such as plastics and nonferrous alloys uses a material called Glo-Mor Fluorescent Crack Detection Ink, developed by Manchester Oil Refinery Ltd., Manchester, England. The ink is equally suited for magnetic materials.

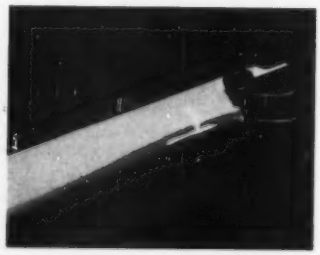
This non-destructive method depends upon the deposition of the ink in surface cracks of the piece under test; the ink in the cracks will then fluoresce when irradiated with ultra-violet light. The indication produced is clearly visible to the naked eye; the cracks showing up in brilliant green color. This method replaces other more costly processes and also removes the difficulties encountered with X-rays.

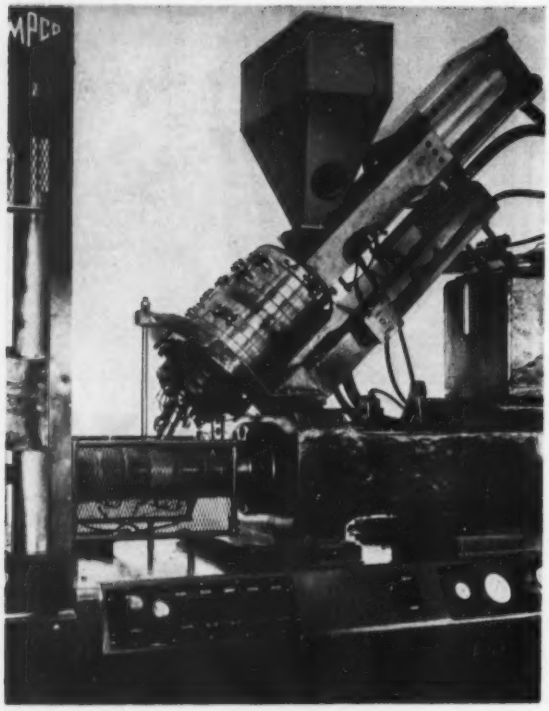
The ink is applied to the surface of the cleaned, degreased test piece by either dipping in a tank or by pouring the ink over the piece. If the test piece is large, the ink can be painted on with a brush. After drying for one minute, the impregnated piece is inspected under ultra-violet light. If desired, the fluorescent background can be removed by quickly dipping the piece in carbon tetrachloride, which will remove the ink from the surface without dissolving it from the cracks.

If the crack extends throughout the cross section, there is no need to remove the background ink because the ultra-violet light can be applied to the face opposite to the one which has been impregnated.

Examination of plastics surfaces for flatness can be accomplished by applying the fluorescent ink to the flat surface and moving a straight edge across it.

With new crack detection ink, surface flaws show vividly under ultra-violet





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THE IMPCO PREPLASTICIZER

The new Impco preplasticizer shown here on the Impco Model 822A machine is available for all Impco VF822 type models. The 150 pound per hour preplasticizing unit contains a hydraulic cylinder and plunger for 15000 p.s.i. at 1000 lbs. pump pressure. Externally and internally heated plasticizing chamber. 50 or 80 ounce injector cylinder externally heated. The increase in production while maintaining maximum high quality will pay for this unit in a very short time. Write for more information.

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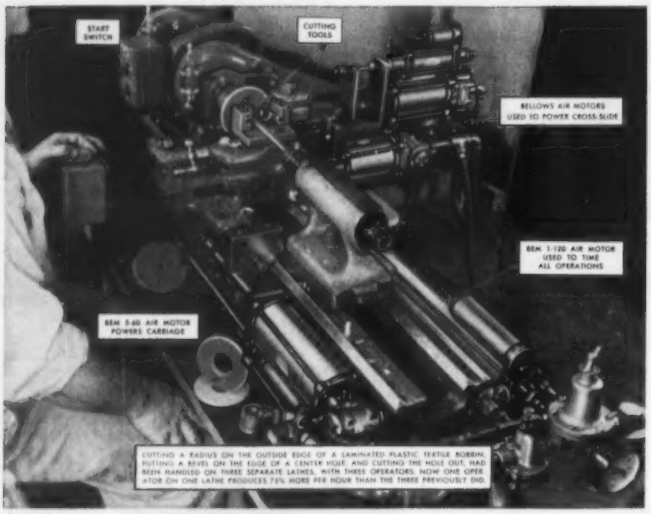

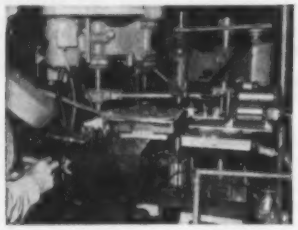

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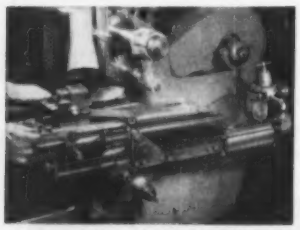

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State of New York
ss.
County of Queens

Before me, Notary Public in and for the State and county aforesaid, personally appeared Charles A. Breskin, who, having been duly sworn according to law, deposes and says that he is the Publisher of the MODERN PLASTICS and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), to wit:

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Forests

(*Continued from pp.* 100-4)

ble ends, and flush wall areas of redwood, fir, and hardwood plywoods are ideally suited to the modern ranch style of home construction. Of course, plywoods of all types have been used for cabinets and interior wall construction.

There is an increase in the interest of the average home owner for wood-paneled rooms and for natural finish wood cabinets and built-ins. For such protected use, urea resin, as well as soya bean, casein, and blood glues are used. Flush doors use three times as much plywood per unit as paneled doors, so should increase the use of plastic adhesives accordingly. The flush area at the same time offers a challenge to the plastics industry for better finishing systems, and considerable progress can be expected along this line.

On the Job Bonding

A big sales potential may also be found in a type of adhesive which can be used safely and with dependable results at the site of fabrication. If room temperatures will assure an adequate bond, much of the present nailing procedure will be supplemented or partly eliminated by gluing the panels or trim to the frames. Since much remodelling is being done by independent carpenters and builders, a foolproof system would be necessary to effect a transition in construction practice. Such a trend is certain to take place and the companies figuratively "on the ground floor" are certain to develop a substantial volume of business. Resorcinol fits into the picture except for pressure requirements. Casein-latex fortified with some chemical to prevent action of mold would be ideal, since it can be bonded with minimum pressures. One firm recently announced a portable high-frequency unit for setting an adhesive which fastens plywood to walls and ceilings. Paralleling satisfactory on-the-job gluing will be the expanded use of prefinished panels, doors, and trim. Saturated polyesters and lacquers are being used very successfully for prefinished panels.

A virtually undeveloped field of use is the farm market. The average farmer does his own work and favors a material such as plywood and lumber which he can use and re-use, as the circumstances demand. Up to 6000 sq. ft. of plywood can be used on each farm, according to agricultural engineers. There are nearly 6,000,000 farms in the country; this means a lot of plywood and most of it is expected to be of phenolic resin exterior type. Water-proof plywood has already dominated the design field for cold storage lockers, dairy and poultry facilities, and many other farm buildings. Practical plans have been developed for grain bins and other farm buildings such as hog houses, cattle shelters, and even silos.

One thing is certain: the farmer is in the best economic position in history, and a lot of attention will be given to servicing his requirements.

In Industry

The past few years have taught the forest products industry the value of the industrial market. Plywood has been steadily developed for industrial uses. Business leaders

predict that a big volume of sales will be developed in industrial channels for standard size laminated boards of various widths, thicknesses, and lengths, and with surface woods having special characteristics. The limitation to date has been an adequate supply of cold setting resin adhesives such as resorcinol or acid-catalyzed phenol. Staging plank, trunk body floors, all sorts of structural and framing members, tops for special work tables, pattern stock, and many other items may soon be available out of warehouse stocks in every industrial area.

Wood Waste Uses

The biggest potential market for plastics in forest products is in various means of making good use of wood waste. Three different spheres of activity should be explored: a) the conversion of wood waste in chips for pulp mill use, which will require additional chemicals and plastics for special paper treatments; b) the conversion of forest tree tops and limbs as well as sawmill and manufacturing waste to hardboards by newly developed methods; and c) the distillation or reduction of wood waste by chemical processes.

Of these conversion processes, the second offers the greatest opportunity for plastics. Urea, phenol, melamine, and a number of the thermoplastics such as vinyl chloride are being used. The powdered resin may be mixed with the chips or the chips or fibers may be tumbled in a vat to be certain that each is coated with resin. The material is then either cold-pressed for preforms or hot-pressed for finished boards. Several new wood fiber boards, smooth on both sides, are now on the market and plant facilities are nearing completion for other products which have just completed the development stage.

Military Specs

Melamine resins which have had very little application in the forest products industry are becoming increasingly important in the hardwood plywood field. Mixtures of 50% melamine and 50% urea are required for packaging type plywood which will take the tests set up for exterior Type I plywood by the military under specification Jan P 139. This type of adhesive is preferred by many of the hardwood plywood manufacturers because it cures at temperatures of less than 200° F.

The big operators of the lumber industry have entered the wood-chemical technology picture. This means substantial volume sales and more consistent operation. Some of these firms will undoubtedly purchase the basic chemicals and compound their plastic adhesives, preservatives, and surfacing materials according to the product requirements. Such research and development programs are expensive, however, and once started must ever be alert to the rapid changes in the field of chemistry. Furthermore, chemical firms serving several segments of industry can better afford future development work. Thus it is expected that most of the plastics materials will be supplied by the plastics industries. The big volume will go to those who by applied research assist the forest industry in the conversion of this country's most abundant and renewable natural resource.—END

Pipe Extrusion

(*Continued from p. 124*)

ticized PVC to a special, adjustable-center, tube die. As the pipe leaves the die, it passes directly into the water-cooled forming tube (Fig. 1). Air pressure is introduced to the inside of the pipe through the mandrel of the die, and it is trapped therein by means of a wooden plug (Fig. 4) which is inserted tightly in the end of the pipe. The air pressure expands the pipe so that its outer surface is in contact with the cooled inner surface of the forming tube. This contact causes the skin of the tube to chill quickly, sufficiently to prevent collapse. Final cooling is accomplished by passing the tube through a water-filled cooling tank (Fig. 2) equipped with flexible rubber baffles or seals at each end.

A positive pulling device has six rollers all driven by the same variable speed motor. The pipe is held in contact with these driven rollers (Fig. 3) by six weighted idler rolls. The speed of this device may be controlled within very fine limits by electronic means, with the regulating controls situated conveniently for the operator near the die.

Special Cut-off

The pipe next reaches a special cut-off machine (Fig. 4) which consists of a belt-driven circular saw with suitable guard. The entire cut-off assembly is mounted on a platform equipped with casters. When the operator desires to cut off a length of pipe, a clamp mounted on the cut-off unit is fixed in position on the pipe. This causes the entire cut-off mechanism to travel in the same direction and at the same speed as the pipe while the cut is made. A new plug is then inserted in the end of the pipe. With the clamp in the open position, the cut-off unit is then returned to its starting point. The manufacturer states that, in the time it takes to cut off the tube and insert a new plug in the end of the pipe, no collapse of the pipe wall occurs at the extruder end.

The operations illustrated in these photographs show the extrusion of a 2-in. o.d. rigid vinyl pipe, with a 5/16 in. wall. The extruder is a conventional Windsor twin-screw RC 100, and the rate of extrusion averaged 70 to 75 lb. per hour.—END

Furfuryl Alcohol

(*Continued from pp. 127-32*)

of soluble alkaline material, as successful resinification of the saturant is dependent upon the presence of acidic catalysts.[3]

Low viscosity acid-activated resin based on furfuryl alcohol is sometimes used to strengthen plaster articles via impregnation and curing at room temperature or at 150 to 160° F. Artware objects resembling ceramics in appearance are made by impregnation of plaster of paris with such resins. The impregnated objects are virtually chip-proof and permit good lacquer retention.

Fibrous Glass Pipe Wrap

A successful application of furfuryl alcohol acid-catalyzed resin as a binder in emulsion form is demonstrated in the manufacture of fibrous glass mats for underground pipe wrap. The resin-bonded mat in roll form is wrapped around steel pipe coated with bitumen or coal tar pitch to protect oil and gas pipelines against corrosion and electrolytic action. The fibrous glass mats bonded with furfuryl alcohol resin have high tensile strength through a wide range of bitumen application temperatures, are wetted rapidly and completely by the bitumen coating, and greatly reinforce the coating.

The resin emulsion is made by heating an aqueous solution of monomeric furfuryl alcohol in the presence of an emulsifier and an acid catalyst. As resinification proceeds the furfuryl alcohol changes to water-insoluble polymer which in turn is emulsified by the colloid. The resulting dispersion is applied to fibrous glass mat and heated to evaporate the water and resinify the partial polymer to the infusible state.[4]

Battery Case Manufacture

A fluid polymer of furfuryl alcohol, stabilized to about pH 7 so as to be storage stable as well as not advance at 300° F., finds application as an additive in the manufacture of asphaltic battery cases.[5] Most of the automotive storage battery cases manufactured in recent years are made from an asphaltic

[3] U.S.P. 2,333,151 and 2,367,312.
[4] U.S.P. 2,397,453.
[5] U.S.P. 2,501,995.

composition containing asphalt, a small amount of synthetic resin, mineral filler, and a reinforcing organic fiber. A large number of these cases contain an acid-sensitive fluid furfuryl alcohol polymer as the synthetic resin. The purpose of the resin additive is to increase the resistance of the molded container to the deteriorating effect of battery acid. Specifically, the resin inhibits the absorption of battery acid by the organic fiber in the composition. Neutralized furfuryl alcohol resin, being stable to advancement by the processing and molding temperatures, remains in the unpolymerized stage until the introduction of battery acid into the container. At that point the resin resinifies to form a barrier which seals off the absorptive organic fibers, thus preventing the effect of acid on the fiber.

Protective Coatings

Favorable results from laboratory and field tests are being obtained on protective coatings based on acid-catalyzed furfuryl alcohol polymer. Such coatings have good adhesion to wood and concrete while applications to metal and nonporous surfaces have been somewhat more difficult. However, special primers have been formulated and are claimed to be effective in bonding the cured coating to metals. It is well to point out that furfuryl alcohol polymer possesses the chemical resistance properties long desired in a functional coating, but in the unmodified form it lacks the desired adhesion and toughness. High shrinkage of the resin during its cure is also a drawback of the straight resin. Modifications should be possible which will not nullify the chemical resistance advantage of the base resin, and much progress is being made in certain quarters along that line.

Adhesives

Furfuryl alcohol is used in formulating gap-filling adhesives from urea-formaldehyde resins.[6] Aqueous solutions of urea-formaldehyde adhesives are most satisfactory in joining smooth surfaces having thin glue lines, e.g., in the gluing of plywood. In gluing rough surfaces or in applying thick glue lines, a urea-formaldehyde resin is subject to cracking and poor adhesion on ag-

[6] U.S.P. 2,518,388.

ing. When modified with furfuryl alcohol, the latter renders such an adhesive resistant to crazing and provides improved dimensional stability. The latter property is clearly demonstrated by subjecting a casting of the adhesive to heat treatment such as 24 hr. at 176° F. The casting will retain its shape without crazing or cracking.

Storage stability of the adhesive syrup is accomplished by heating the urea resin in the presence of furfuryl alcohol for a short time in the presence of mild alkalinity. The formulated adhesive is catalyzed to infusibility by the usual aqueous solution of acid-yielding compounds and buffers employed with urea glues to balance proper curing characteristics with sufficient working life. The adhesives known commercially as Urac 185, Plaskon 530-11L, FA-300, and Resinbond 500 exceed the minimum requirements of Army-Navy Aeronautical Specification AN-G-8 for Glue, Cold-Setting Resin, and Federal Specification C-G-496 for Adhesives.

Furfuryl alcohol acid-catalyzed liquid resin[7] forms the basis for a special low-temperature-setting adhesive used in the aircraft industry. It is used in the bonding of wood and plastic parts which would warp and deform on application of localized high temperature. The adhesive[8] is a liquid thermosetting resin of essentially 100% potential solids, is stable to storage, and is activated for application with an acidic catalyst which causes the resin to cure at room temperature (above 75° F.). The absence of volatile materials also permits its use in a cast-gluing technique for bonding rough or porous surfaces. It is demonstrated on the basis of shear tests that the glue line thickness is not critical with an adhesive of this type which contains no volatile matter[9,10].

[7] U.S.P. 2,423,139.

[8] Resin X-2 of Furane Plastics, Inc.

[9] Air Force Technical Report No. 5928.

[10] H. R. Simonds, A. J. Weith, and W. Schack, "Handbook of Plastics", 2nd Ed., pp. 292-7. New York: D. Van Nostrand Co., Inc.

Laboratory Preparation

The following method for preparing a laboratory size sample of a viscous furfuryl alcohol resin does not pretend to indicate commercial practice in the resin industry, but is given as a typical preparation to demonstrate in its simplest form resinification with an acid catalyst. The catalyst (2.5 g. of 85% phosphoric acid diluted with 50 g. of water) is added to 500 g. furfuryl alcohol in a 1-l. three-neck flask, and heated to reflux over a period of 15 minutes. Reflux temperature is maintained for 4¾ hours. The system is then neutralized to about pH 5 with aqueous sodium hydroxide solution, the water layer decanted, and the product vacuum distilled for about 1 hr. or until a system temperature of 125° C. is reached. The resulting dark viscous resin is obtained in approximately 80% yield. It is important to mention that the resinification reaction is exothermic and those not skilled in handling similar reactions should not do so on a large scale.

A variety of acid-sensitive furfuryl alcohol polymers and cements are available from resin manufacturers and from firms specializing in corrosion-resistant construction. Such intermediate polymers are marketed in the soluble fluid state in a wide range of viscosity—from 600 centipoises to extremely viscous liquids. In general, low vis-

cosity furfuryl alcohol polymer is soluble in ethyl alcohol; more viscous reaction products are only partially soluble in alcohol and require solvents such as esters, ketones, aromatic hydrocarbons, and the like for complete solution. A medium viscosity polymer at a pH between 5 and 8 is considered storage stable (no significant change in viscosity for over a period of one year at 70 to 90° F.).

On the addition of acid the polymers advance through a rubbery stage and harden to infusibility under the influence of heat or at room temperature depending upon the activity and concentration of the acid. In the presence of strong mineral acids such as sulfuric or hydrochloric they cure rapidly to the black, hard, brittle, and infusible stage. Milder acids, such as maleic, oxalic, and phosphoric, yield fluid systems which remain in that form for several hours before gaining appreciably in viscosity. The stability in the presence of such acids is further enhanced by solvents such as alcohols, ketones, esters, and aromatic hydrocarbons, as the latter tend to retard the effect of the catalysts. Acid catalysts appreciably milder than the above, e.g., acetic acid, are not effective in fully curing the polymer even at elevated temperatures.

The need for strong acids in order to reach the thermoset stage of furfuryl alcohol polymer limits the resin to applications that take advantage of such catalysts or which can tolerate strong acidity. While fillers like carbon, acid-washed asbestos, diatomaceous earth, and glass fiber are used to extend or reinforce the resin, wood-flour, canvas, paper, and other cellulosic fillers or fibers have not been employed industrially due to the deteriorating effect of strong acid catalysts on these materials. The need for acid catalysts is also the determining factor in the methods used to mold, laminate, cast, or bond with the polymer. Unprotected steel molds and laminating platens are corroded when acid-catalyzed resins are cured at elevated temperatures. To utilize the inert properties of furfuryl alcohol polymers, special molding and laminating techniques have been devised as suggested in previous paragraphs.

The resin is widely compatible with plasticizers, synthetic thermoplastic and thermosetting resins, natural resins, synthetic rubbers, and asphalt. In certain applications the resin is successfully modified with one or more of such additives to improve toughness, flexibility, and adhesion to non-porous surfaces.

Furfuryl alcohol acid-catalyzed reaction products may be chemically modified by reaction with formaldehyde, methylol ureas, methylol melamines, etc. As much as 0.6 mole of formaldehyde readily reacts with 1 mole of furfuryl alcohol in the presence of acid catalysts. Such resins[1] find application as modifiers of water-soluble phenol-aldehyde resins where the latter are used for honeycomb type wall structures. In general, the reaction between formaldehyde and furfuryl alcohol proceeds with less total acidity or at a more moderate pH than the acid resinification of furfuryl alcohol alone. However, the chemical resistance and the over-all properties of both the two fully cured polymers are similar.—END

[1] U. S. Pat. 2,343,972.

Citric Acid

(*Continued from pp.* 134-8)

Sheetings prepared with acetyl tributyl citrate, using the formulation shown in Table IV, underwent the least change in color when subjected to temperatures of 160° C. for varying periods of time up to 4 hours. Since calcium stearate, the stabilizer used in this study, is not a very efficient heat stabilizer, it may be inferred that acetyl tributyl citrate improves the heat stability of vinyl resin formulations plasticized with it. This was further borne out when dioctyl phthalate and octyl phenyl phosphate were partially replaced by acetyl tributyl citrate. These specimens discolored to a lesser degree than did the sheetings prepared with only dioctyl phthalate or octyl phenyl phosphate. Obviously, formulations with good heat stability are prepared with the latter two plasticizers when a proper choice of stabilizers is made. However, this study indicates that acetyl tributyl citrate formulations may possibly be prepared with lesser amounts of stabilizers and still be satisfactorily stabilized against heat degradation.

This acetylated butyl ester of citric acid is a valuable addition to the small list of accepted nontoxic plasticizers. In addition to its use in preparing products for food wrappng, it can serve as a plasticizer for vinyl film, sheeting, and tubing formulations, either by itself or as an extender for other more expensive plasticizers.

Citric Acid

In the plastics industry, citric acid is of prime interest as a raw material for the production of plasticizers and resins. However, a number of applications for the acid, per se, have been described. The inclusion of small amounts of citric acid in lacquers and enamels has been shown to retard "livering" (premature gelation) and in some cases to prevent it from taking place (1,2). The acid has also been found to be a valuable ingredient in lacquers, since its presence prevents "blooming" and "greening" when cellulose nitrate lacquers are used to coat copper-containing metals (13). Ethyl cellulose molding compounds, to which a small amount of citric acid has been

added, have been shown to possess improved light stability (17).

Citric acid has been found to be an excellent raw material in the production of certain resins. For example, a good sand core binder has been prepared by reacting citric acid with glycerol (27). Glycitric resins, which are water-soluble products, have been shown to be excellent film-forming products, eliminating the need for hazardous organic solvents (6). They have been recommended for use as protective coatings and linoleum resins, and as replacements for linseed and tung oil. Alkyd resins prepared with citric acid as the acid component are heat-hardenable products (11).

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Coated Fabrics

THE continuing increase in business for vinyl coated fabrics and vinyl sheeting is today one of the brightest pictures in the plastics industry. According to the Plastic Coatings & Film Assoc., shipments of vinyl coated materials by their members in the first six months of 1952 exceeded the same period of 1951 by 1,201,354 linear yards. Sheeting (unsupported film over 10 mils in thickness) shipments exceeded the same period in 1951 by 2 million yards. These figures represent about 60% of the vinyl coated fabric industry and about 80% of the vinyl sheet industry.

Total shipments of vinyl coated fabric by members of the Association in the first six months of 1952 were 22,009,793 linear yards. Sheeting shipments were 28,570,307 sq. yd. with more than 17 million of that amount in the 10 to 15 mil classification.

Pyroxylin coated materials dropped from 22 million to 15.6 million linear yd. in the comparative periods.

The reasons for this increase in business, when most other plastics show a decline in the same period, are numerous. Probably the outstanding factors in this growth are that last year's big inventories have been eliminated; furniture sales where vinyl coated fabric and sheet are used as upholstery have held up surprisingly well; and the number of applications is increasing.

The increase represents an expansion all across the board in all types of sheet and coated fabric, but there are some variations that need explanation. There was a serious decline in the amount of sheet used for dinette sets because of the decline in public purchasing; but that decline in use of upholstery has been more than offset by expanding use of sheet and coated fabric in such items as reclining chairs, sofa beds, and other deep spring or felted furniture. One big producer of reclining chairs says that 85 to 90% of his output is now upholstered with vinyl.

Other increases for vinyl coated fabric and sheet are in luggage, pocket books, wallets, novelty goods of all sorts, gun cases, loose leaf book binding, and the like. Much of this is in the lighter weight sheet which helps to explain the increase in sheeting, because coated fabric has in some cases superseded sheet in the upholstery market. The very light coated materials, such as paper used for some book bindings, are still pyroxylin, but even in this field vinyl is expected to eventually make its mark.

There was also a reported decline in civilian uses for heavy coated fabric, but this has been offset by increasing military uses for the material in truck cab upholstery and large troop-carrying airplanes. There is also a trend toward vinyl coated fabric in railroad seating, where coated fabric can be obtained for one fifth the cost of 12 to 15 dollar a yard plush.

Two to one preference for plastic materials in luggage by the American public is claimed by the Plastic Coatings & Film Association. The Association estimates that 70% of all luggage sold is made of plastic. Producers predict that the luggage and leather goods industry will use from 5 to 10% more vinyl in 1952 than in 1951, and pyroxylin materials will be consumed in about the same quantity as in 1951. The largest use of vinyl and pyroxylin has been in women's luggage.

Low-Cost Urea Molding Compound

ANOTHER major producer of urea molding compound has now come into the market with a new low-cost black and brown urea plastic material, recently announced by Henry W. DeVore, molding compound sales manager of Plaskon Div., Libbey-Owens-Ford Glass Co.

Mr. DeVore points out that the outstanding feature of the new compound is that urea's excellent electric and physical properties are now available in a price range below that of any standard molding compound. The new material sells at 18¾¢ per lb. for quantities over 20,000 pounds.

Among the physical characteristics of this new molding compound are its non-bleeding properties when immersed in water. Both the black and the brown urea compounds are light-fast. Moreover, color uniformity, the lack of which in other low-cost compounds has long plagued plastic molders, is guaranteed by the producer.

Shrinkage of the new compound is 0.006 to 0.014 in. per in., and it has an arc resistance of approximately 90 seconds. In addition to wiring devices, it is expected to find application in the manufacture of such products as buttons, buckles, bottle caps, stove and refrigerator parts, premiums, and electrical component parts.

Large Laminate

SHEET laminate 4 by 10 ft. is now being produced in a new press installed by The Formica Co., Cincinnati, Ohio. The new sheets will be 1 ft. wider and 2 ft. longer than the largest size previously manufactured. Principal advantages to be derived from the new dimensions will be the elimination of the need for joints on large installations such as bars and wall panels. While the laminating press will be used principally to turn out decorative sheets, it will also permit Formica to produce a high volume of material for defense purposes if the need arises.

Three stories high, the press is capable of turning out 4480 sq. ft. of Formica, or 112 sheets in a single run.

Heavy Gage Insulated Sheet

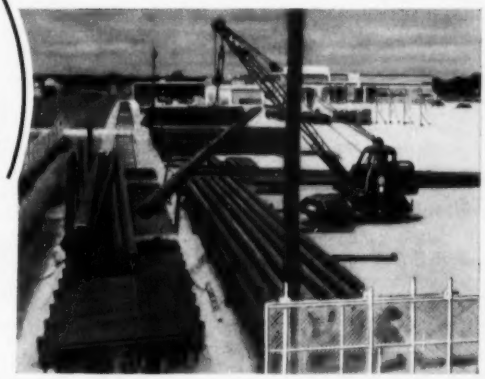
TWO new grades of heavier and thicker fibrous (Kraft pulp) insulating sheet materials have been announced by Rogers Corp, Manchester, Conn.

The older type of Rogers board sheets had a maximum thickness of about ⅛ inch. The new thicknesses go up to 3 inches. The two new grades, Duroid 700 and Duroid

* Reg. U. S. Pat. Office.

Overall View of the New Service Center

SERVICE CENTER *for a* SERVICE COMPANY



Newest in materials handling design throughout

Headquarters for maintenance, purchasing, stores and stores accounting of the Beaumont electric transmission and distribution division

The construction of this new Service Center at Beaumont, Texas, is one of many projects undertaken by Stone & Webster Engineering Corporation for Gulf States Utilities Company.

The new facilities include unloading dock and railroad spur, specially constructed yards for heavy equipment storage, the office building with auditorium and kitchen, the storehouse, a substation, garage, and paint shop.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY *of* STONE & WEBSTER, INC.

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800, are comparable in physical strength to fabric-base laminates and stronger than paper-base laminates.

Both of the new materials can be readily drilled, tapped, machined, or sawed, and are not brittle—that is, they have a surface hardness that will not nick tools.

In the lighter gages—0.031 to 0.125 in.—Duroid 700 is used for formed electrical insulating parts, and Duroid 800 for flat insulating parts requiring a low rate of water absorption. In some instances, Duroid 800 has replaced paper-base laminated phenolic for the sole support of current carrying parts.

The new heavy gages are notable for their improved water absorption characteristics, which in turn provide improved dimensional stability and contribute greatly to surface flatness.

Glass-Cellulose Preforms

HIGH density pulp-molded preforms that may contain up to 90% by weight of fibrous glass have been put into production by Hawley Products Co., St. Charles, Ill.

The use of fibrous glass as a reinforcing agent is, of course, well known, but until recently it was not possible to put glass into wet processes, such as paper, fiberboard, and pulp moldings. When standard cut fibrous glass is slurried in water, it first falls into strands and then each strand separates into filaments. According to Dr. J. C. Williams, Director of Research for Hawley, these filaments form an unusable cottony mass of no reinforcing value.

The process recently announced by Hawley requires no pre-treatment of the glass and also permits reduction of the fiber to the strand if required.

In the pulp molding technique the preform is made in 20 to 40 sec. and ordinarily is self-supporting when removed from the forming screen. It is oven dried without resin treatment, and molded as usual. The preform may also be dipped in resin and drained before molding. Its density and strength make it particularly suitable for bag molding. Values as high as 30,000 p.s.i. flexural and 30 impact have been obtained. The cellulose does not appear to affect the strength loss on a 3-hr. boil.

Many pulp molded preforms of the cellulose variety are dried under pressure in heated dies (similar to hard fiberboard) to produce tropical helmets, carrying cases, shaped packages, etc. Incorporation of 25% stabilized fibrous glass into a carrying case preform raised the Izod impact from 4 to 12 per in. of notch and flexural strength from 5000 to 10,000 p.s.i.

Styrene Heat Resistance

POLYSTYRENE that will withstand 220° F., or about 20° higher than the usual temperature withstood by regular polystyrene, has been announced by The Dow Chemical Co. The material will be known as Styron 700 and is expected to be of particular interest to manufacturers of such products as radio cabinets, battery cases and covers, electrical coil forms, bases for printed circuits, appliance knobs, display racks, light diffuser panels, packaging, bristles, and extruded film and sheet.

Soil Conditioners for Baseball

RESULTS of the experimental treatment of the Hudson Field Baseball Park at Dayton, Ohio, with Monsanto's Krilium have recently been reported. Treatment of the skin area of the baseball field with this material was started in 1950 and has been found to decidedly improve the general workability of the soil and also to provide other advantageous characteristics with regard to the playing condition of the field. The treatment, for example, made possible the working and conditioning of the field while the base lines were too muddy to work. There was also a slight reduction in dusting of treated areas during play. Moisture retention by the treated soil appeared to be superior to the untreated. Further testing will be required to definitely establish optimum application rates, which appear to be between ½ and 1 lb. per 100 sq. feet. The soil was prepared for treatment by spiking or raking to about ¾ inch.

It is believed that results were satisfactory enough to indicate that many baseball parks will be treated with Krilium in the future. Ball players from other teams in particular said that the field was the best they had ever played on and that they liked the slightly resilient characteristic of the soil. The Pittsburgh National and St. Louis American League ball parks have been treated with Krilium, but at present no reports are available on results.

Porous Fluorocarbon

SUB-LICENSES for the preparation of porous fluorocarbon are available from Markite Co. under patent number 2,573,639. This patent pertains to the preparation of a porous article of trifluorochloroethylene polymer. The finely divided powder of the polymer is cold-molded at a pressure greater than 500 p.s.i. After removing from the mold the object is sintered at an elevated temperature not in excess of 250° C.

Communications concerning sublicenses should be addressed to Myron A. Coler, Markite Co., 155 Waverly Place, New York 14, N. Y.

Chemical Resistant Cement

ANNOUNCEMENT of a new and improved resin-base chemical resistant cement has been made by the Irvington Varnish and Insulator Co., Irvington, N.J. The cement not only provides high tensile strength and low shrinkage, but also provides good resistance to oxidizing solutions and excellent water and thermal stability.

The new resin cement, called Fura-Tone 1347, may be used for lining tanks or as a cement for chemical bricks to obtain good chemical and physical properties.

Vinyl Film

VINYL producers won't give up on the idea that vinyl film has a future in packaging. The Goodyear Tire & Rubber Co., Akron, Ohio, for example, has just come up with a new special type of Pliofilm which they claim will not cling to or pucker the packaged product. Designated as Pliofilm 80VW (80 gage thickness), the Goodyear product is asserted to be tear-resistant, transparent, and successful in eliminating the problems of cloudiness or


VISIBILITY by Swedlow in the F-94C Starfire
Swedlow
PLASTICS CO.

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bleeding plasticizer which supposedly has affected other vinyl films used for packaging.

The relationship of this new vinyl Pliofilm to Goodyear's well-known rubber-hydrochloride product of the same name is not stated, but an observer could guess that the new product is cast vinyl produced on the same equipment.

Stabilizer Inhibits Spew

PRODUCTION of an important new vinyl stabilizer, Staycin 1, has been announced by Baker Castor Oil Co., 120 Broadway, New York, N.Y. It not only is an all-purpose stabilizer, but can also prevent spewing when oil type plasticizers are used. It is claimed that this is the first product offered which will stabilize against plasticizer exudation. Spew-free life of films may, as a result, be extended from months to years.

Staycin 1 is a complete stabilizer; no additional stabilizer or lubricant is required. Stabilization against heat and light, as well as lubrication during processing, have been incorporated. The approximate selling price of 65¢ per lb. makes it competitive with other high quality stabilizer systems.

The development of Staycin 1 by Baker is a result of their efforts to improve the performance of ricinoleate and acetoxystearate vinyl plasticizers. These two plasticizers have had only limited use because of their exudation tendencies, although it has long been recognized that they give outstanding flexibility, drape, and have excellent processing behavior. Five-fold increases in spew-free life have been reported as possible with the use of Staycin 1 in stabilizing polyvinyl resins co-plasticized by ricinoleates.

Reinforced Plastics Officers

THE Reinforced Plastics Div. of S.P.I. has elected Harold B. Freeman as executive chairman for the ensuing year.

Other officers are Richard Malamphy of Naugatuck Chemical as Eastern chairman; Roger B. White, president of The Glastic Corp., Cleveland, as Midwestern chairman; and W. Brandt Goldsworthy, president of Industrial Plastics Corp., Gardena, Calif., elected as Western chairman.

New Grade Laminate

INTRODUCTION of a new grade of laminated thermosetting sheet material has been made by Continental-Diamond Fibre Co., Newark, Del. Called Dilecto GM-1, the material is a fibrous glass mat melamine resin bonded product with high arc and flame resistant qualities. It is lower in cost than currently available woven glass fabric base melamine laminates. It is suitable for switchboard panels, subpanels, structural parts, slot wedges, arc barriers for switches, and circuit beakers.

Dilecto GM-1 is moisture resistant and possesses good electrical properties, particularly arc resistance, and has been tested to withstand 160 to 185 seconds. The heat resistance is rated at 300° F. continuous, and 350° F. intermittent.

Production at present calls for 38 by 38 in. and 38 by 42 in. sheets in a thickness range from 1/16 to ½ inch.

Printed Film

ADDITION of a printing service to the operation of the Firestone Plastics Co., Pottstown, Pa. has been announced. Hereafter, the company will furnish a full line of stock prints, and, according to company spokesmen, this puts it in the position of offering a fully integrated service from the raw material through the finished film and sheeting.

The company formerly furnished only plain colors in smooth or embossed finishes, while all prints were handled by the Hartford Textile Corp. in New York. Hartford will continue to handle the retail yard-goods sale of Velon films under the trade name of Beutafilm. All manufacturer accounts formerly serviced by Hartford will hereafter be handled directly by Firestone sales personnel of Hartford's Manufacturers' Sales Div., which has been absorbed by Firestone.

Kenneth L. Edgar has been appointed manager of Manufacturers' Sales for both films and sheetings by Firestone; Charles F. Edelmann has been appointed staff trade manager of sales of Velon film; E. H. French, Jr. has been named manager of the Contract Printing Div., with headquarters at Pottstown, Pa.

New Monomers

PRICE reductions recently announced by American Monomer Corp., Leominster, Mass., affect four new monomers heretofore available only in laboratory quantities. Ethylene glycol dimethacrylate, cyclohexyl methacrylate, and monomer MPL have been reduced to $2 per lb. in the technical grade. Butyl acrylate has been reduced to $1 per pound. These monomers are finding increasing use for specialty cross linking agents for use in polyesters, preparation of ion exchange polymers, plastic sheeting and molding powder, and similar uses where active cross linking agents are desired.

Butyl acrylate is of particular interest in copolymerization with other acrylates, vinyl acetate, butadiene, acrylonitrile, and similar monomers where internal plasticization of a copolymer is desired.

Dimethyl acetamide, which has hitherto been a rare chemical, is now available commercially for the first time at $2 per pound. This material is an active solvent for such materials as Orlon and nylon and its use is suggested for specialty adhesives and solvents.

Polyethylene Jars

BLOW-MOLDED, light-weight polyethylene wide-mouthed 4-oz. jars for application in the cosmetics, drugs, and other fields have been announced by the Plax Corp., West Hartford, Conn. and are claimed to be the first of this type of jar to be blow-molded of polyethylene.

The new jars have a range of colors and can be printed or labeled with special embossed surface effects; they weigh only one-tenth as much as their glass counterparts.

Among other advantages, the new container is unbreakable and will not crack if the contents freeze. Since water does not adhere to the surface of the plastic, the jar is also slip-proof.

Blow-molded with a ridge around

blend to blend...
beginning to end...

colors alike as two peas in a pod

***New booklet* tells how to get eye-perfect COLOR UNIFORMITY ... dry coloring Lustrex Colorant Blend**

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Since the last time you "looked"—dry coloring has stepped out in seven league boots. New methods, new techniques have improved uniformity in dry coloring so that products that are many moldings apart are as alike as two peas in a pod.

For your benefit, Monsanto has gathered information about the latest techniques for improving color uniformity when dry coloring Lustrex Colorant Blend styrene. For your *free* copy of this important new bulletin, mail the coupon below ... today!

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the bottom, the uncapped jars may be shipped with the neck of one around the ridge of the next jar, thus saving shipping space.

Saran Bristles

SARAN bristles are completely replacing the Chinese hog bristles that had been used for more than 70 years in Bissell sweepers.

"The saran bristles are tougher and more durable than the animal bristles," explains Mr. Irving J. Bissell, vice president of the Bissell Carpet Sweeper Co. The brushes have been tested in both hotels and on testing machines for the equivalent of 10 hard service years.

Pigment for Extrusion Compounds

NATURAL color vinyl compounds can be colored for around 1¢ per lb. with R-B-H pigments, as compared with the usual premium of 5¢ or 6¢ for pre-colored compounds, according to R-B-H Dispersions, Div. Interchemical Corp., Bound Brook, N.J.

Company literature states that vinyl dry blend compound can be efficiently and uniformly colored by the new R-B-H plastic powders, which are pulverized masterbatch dispersions of pigments in R-B-H Resin 510. Resin 510 is a thermoplastic, friable, hydrocarbon resin with good dielectric properties; it is completely compatible with vinyl, as well as other thermoplastics, including polyethylene, polystyrene, cellulose acetate, and ethyl cellulose.

New Textured Drapes

AS an indication of their belief in the future of plastic drapes and their confidence that sales can be promoted by energetic selling, the Avon Curtain Sales Corp., 230 Fifth Ave., New York, N.Y., has introduced new decorative patterns in ready-to-hang draperies that will be distributed through leading chain and department stores to retail for $1.98.

The new patterns, of textured Comark plastic fabrics, include "Bamboo," a varied color combination on a cream background; "Groves"; "Fields"; and "Cassandra," a striped South American fiesta motif.

Dibutyl Phthalate

THE uses and properties of dibutyl phthalate are described in a technical service report just issued by the Witco Chemical Co., 295 Madison Ave., New York, N.Y.

Dibutyl phthalate has long been known as a plasticizer for nitrocellulose lacquers. It has also been used to a limited extent in polyvinyl chloride coating compositions, in phenolic resin laminating varnishes, and in proportion of up to 10% by weight of cellulose acetate. Further uses are as a plasticizer for polystyrene and polymethyl methacrylate, where it is of special value in molding compositions.

Display Figures

VINYL Stik-On letters for use in window displays, on bulletins, and the like, are now being furnished in units that contain fifty 3½- and fifty 1¼-in. figures and one hundred and fifty 2-in. and the same number of 1¼-in. letters in a package that retails for $15.50 by Keewsye Co., Inc., 19 Kingston St., Boston, Mass.

Each package also contains eight white and blue vinyl mounting strips, corners, and numerous decorative pieces, such as stars and arrows.

These plastic letters and figures adhere to any non-porous surface by using just a little pressure. The only requirement is that both the vinyl and the mounting surfaces must be clean.

Latex Adhesive

SUITABLE for bonding vinyl, glass, metal, concrete, and other materials, a new latex adhesive has been announced by the General Latex & Chemical Corp., Cambridge, Mass.

The adhesive, known as P-13, combines the advantages of a latex adhesive with the advantages of a solvent cement, without danger of fire or explosion. It can be used as a wet adhesive or can be dried down to form a tack-free film and adhered by the application of heat. Large quantities are being used in the plastic flooring field.

Polyester Plasticizer

NITROCELLULOSE users will be interested in a new polyester resin plasticizer, Bonner L-894, developed by Bonner Chemicals, Inc., 31 Spruce St., Leominster, Mass.

Films plasticized with this material exhibit high gloss, high flexibility, and high tensile strength. This polyester plasticizer's compatibilities include cellulose esters, ethers, chlorinated hydrocarbons, and some of the vinyl copolymers.

The producer claims that the plasticizer has a wider range of compatibility than is possible with conventional sebacic acid modified plasticizers.

Setting Acrylic Without Heat

DENTISTS were among the early pioneers in handling plastics materials, particularly acrylics. They have developed many interesting methods for handling acrylics, and it is possible that many non-dentist molders could profit by studying some of the things that dentists have done. Among the latest suggestions coming to our attention is an acrylic denture made of material furnished by B. L. Dental Co., Inc., 111-28 76 Drive, Forest Hills, N. Y., that will cure in about 15 or 20 min. in a plaster mold without heat. The material is also being used for fixtures that cure in the patient's mouth without pressure in about 6 minutes. The material cures faster in the mouth because body heat speeds the cure.

Among possible applications for this material outside of the dental field would be for molding ear pieces for hearing aids or for any other application where the direct application of heat would be an impractical operation.

Acrylic Monomer

TRIAL lots of a new acrylic monomer, called Acrylamide, are now available from American Cyanamid Co., 30 Rockefeller Plaza, New York, N.Y. Acrylamide is a crystalline product with comparatively long shelf life and easily gained polymerization and copolymeriaztion.

Potential applications for the polymers and copolymers of Acryl-

NOW AVAILABLE
A Stabilizer for Vinyls That Inhibits Plasticizer Exudation

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amide include the preparation of adhesives, dispersing agents, thickening agents, surface coatings, and finishing agents for paper and textiles. The material also has general reactivity to a number of compounds, making it valuable as a chemical intermediate.

Polyethylene Tubing

AVAILABILITY of narrow width polyethylene tubing—in sizes as small as 1 in. wide layflat with 0.002 in. wall thickness—has been announced by Chippewa Plastics, Inc., 210 E. Columbia St., Chippewa Falls, Wis.

Surface Printing Inks

SOLVENT system surface printing inks based on polyvinyl chloride resin for wallpaper printing machines are being offered by Claremont Pigment Dispersion Corp., 110 Wallabout St., Brooklyn, N.Y. The inks dry thoroughly at temperatures of 125° F. in from five to ten min., and have no after-tack or pick-off. A complete range of non-crocking, non-bleeding, light-fast colors are available.

Laminate for Textile Cylinder

SIZING cylinders for the textile trade are being manufactured by Wood Plastic Co., Wayne, Pa., from a special moisture resistant machining grade of General Electric Co.'s laminated plastics tubing developed especially for this application. The new laminate, now in production at G-E's Chemical Div. plant in Coshocton, Ohio produces cylinders of exceptional durability and long service, which have excellent moisture, and acid resistance.

The cylinders, which are presently being used to handle nylon and silk, measure 7 in. long, have an inside diameter of 5⅝ in., and a wall thickness of ¼ inch.

PERSONAL

Robert K. Mueller, Hampden, Mass., has been named general manager of **Monsanto Chemical Co.'s Plastics Div.** in Springfield, Mass., and Port Plastics, Ohio. Mr. Mueller succeeds vice president **F. A. Abbiati**, who died August 13.

After graduation from Washington University in St. Louis in 1934 and a year at the University of Michigan, where he acquired a master's degree in chemistry, Mr. Mueller joined Monsanto in 1935 as a control chemist in the St. Louis plant. In 1938 he was transferred to Monsanto's Shawinigan Resins Corp. at Springfield, and in 1939 went to the company's Plastics Div., where he became operating superintendent in 1940.

During the war, Mr. Mueller was a staff member of the Longhorn Ordnance Works plant in Karnack, Texas, where he became plant manager. At the end of the war, he returned to Spiringfield and in 1947 became assistant production manager. He was appointed assistant general manager to Mr. Abbiati in October 1950.

F. H. Ebbert has been appointed vice president and general sales manager of **Gustin-Bacon Mfg. Co.**, Kansas City, Mo. He has been vice president and sales manager of the company's **Automotive Div.** since 1946.

Walter S. Schamel is the new district manager of the Los Angeles office for **American Wheelabrator & Equipment Corp.** His new offices are at 3155 Leonis Blvd., Los Angeles.

Herman G. Baur has been appointed sales manager of **Ball & Jewell, Inc.**, 24-28 Franklin St., Brooklyn 22, N. Y., to succeed **Dewey Rainville**, who has resigned.

William G. Van Beckum, newly appointed director of research and development for the **Pacific Lumber Company**, will head the company's development of redwood by-products for use in the plastics industry.

Arnold Kneitel has been appointed to the sales staff of the **Bishop Mfg. Corp.**, Cedar Grove, N. J. Mr. Kneitel is a specialist in silicone products and will supervise silicone sales in relation to electrical insulation manufactured by Bishop. Mr. Kneitel was with the General Electric Co. for the last five years.

Frank Sherry has been named production manager of **B. F. Goodrich Co.'s Plastics Products Div.**, Marietta, Ohio. He moved to the new post from B. F. Goodrich Rubber Co. of Canada, Ltd., where he was production manager of the processing division. Mr. Sherry has been with Goodrich for 11 years.

Frank J. McCormick has been appointed sales manager in charge of furniture sales by **Federal Leather Co.**, Belleville, N. J. He has been with Federal Leather since 1950.

R. F. Brown has been named assistant sales manager in the **Industrial Chemicals Div., Carbide and Carbon Chemicals Co.** His former position in Chicago as Mid-western division manager has been filled by **R. M. Joslin, Jr.**, who moved from the Philadelphia area.

Richard J. Hough has been named West Coast district manager of the **Plastics Div., Celanese Corp. of America** and will make his headquarters in Los Angeles.

Alfred H. Lincoln, formerly with the **Tillotson Rubber Co.**, has joined **Granet Corp.**, Framingham, Mass., as chief chemist. Granet manufactures latex products.

R. A. Hoekelman has been named assistant general manager of the **Plastics and Resins Div., American Cyanamid Company.** He joined American Cyanamid in 1930 and since 1940 has served as assistant treasurer and comptroller.

Sidney D. Yarm has been named as assistant to **George Lubin**, director of research for **Bassons Industries Corp.**, Bronx, N. Y. Mr. Yarm has been designing and preparing specifications for electromechanical equipment for the New York Naval Shipyard for many years.

J. M. Selden has been appointed manager of the **Eastern Div., Shell Chemical Corp.** Mr. Selden has been selling Shell chemical products since 1933.

Dr. George S. Bacham has been appointed director of research for **Pittsburgh Plate Glass Co.'s** new

PLASTISCOPE

Fiber Glass Div. He has been with the company since 1947 and previously served as ceramic engineer with **Owens-Illinois Glass Co.** As director of research, his headquarters will be located at Shelbyville, Ind. Initial production from this plant is expected within the next few months.

Robert W. Wilson has joined the **Plaskon Div., Libbey-Owens-Ford Glass Co.** as patent counsel. He served **B. F. Goodrich Co.** in patent work for the past six years.

J. F. Sequin has been appointed southwestern representative of the **Crystal Tube Corp.**, 6625 W. Diversey, Chicago, Ill. From his headquarters in Dallas, he will represent the Chicago firm who distribute converted cellophane, polyethylene, and other transparent packaging materials.

Dr. M. H. Bigelow, technical director, **Plaskon Div., Libbey-Owens-Ford Glass Co.**, has been named director-at-large of the Armed Forces Chemical Association, and secretary of the Great Lakes Section, Forest Products Research Society.

R. Marvin Garrett has become a partner in **Silver Plastic Co.**, P. O. Box 14093, Los Angeles 49, Calif., and will direct the sales of his company which is now doing high vacuum metallizing. He was formerly sales engineer with the Los Angeles sales office of the **Taylor Instrument Co.**

Robert H. Roemer has been appointed sales manager of Toscony Fabrics, Inc., 303 Fifth Ave., New York, N. Y. Mr. Roemer joined Toscony in January 1951, after 15 years of service with **Carbide and Carbon Chemicals Co.** and with **Bakelite Co.**

Clifford S. Vaughn has been named assistant to **George W. Cook**, manager of **The Bellows Co. of California**, with offices at 733 E. Pico Blvd., Los Angeles, Calif.

Whitney N. Shepard has been made director of sales of **Boston Woven Hose and Rubber Co.**, Cambridge, Mass., and will be responsible for all marketing activities of the company. He has been promoted from head of Plastic Sales, which position he assumed in February 1952. In his new position, he will take charge of the company's expanded marketing program which has been necessitated by increasing diversification of the company's products. The company is the developer of the "Rotocure" process for continuous vulcanization of rubber as well as the continuous processing and laminating of various plastics.

***F. A. Abbiati*, 47, vice president of *Monsanto Chemical Co.* and general manager of the company's division at Springfield, Mass., died of a heart attack on August 13 at the New England Baptist Hospital in Boston. He is survived by his wife and two children, Melvin and Marie Virginia.**

Mr. Abbiati was a native of Barre, Vermont, and received a B. S. degree in chemistry from the University of New Hampshire. He joined the Merrimac Div. of Monsanto after graduation in 1927 and was transferred to Springfield as salesman for Vuepak in 1938. He became assistant general manager of sales in June 1939 and general manager of sales in February 1944. He was appointed to his last position in October 1950.

Robert A. McLaughlin has been appointed director of sales for **Pittsburgh Plate Glass Co.'s** new **Fiber Glass Div.**

Thomas A. Collins has been elected to the newly-created position of executive vice president of **Glass Fibers, Inc.**, Toledo, Ohio.

Arthur J. Miller, Jr., general manager of the **Plastics Div., Doughboy Industries, Inc.**, New Richmond, Wis., was elected a vice president of the company at the annual meeting held by the Doughboy Industries' stockholders.

COMPANY NOTES

Columbia Protektosite Co., Inc., has announced the appointment of **H. T. Glatt** as director of sales, succeeding **S. A. Bell.**

Precision Plastic Products, Inc., has moved its plant and offices to 225 N. Racine Ave., Chicago, Ill.

Kraloy Plastic Pipe Co., Inc., 4710-20 E. Washington Blvd., Los Angeles, Calif., is the new name of the company which heretofore has been known as **Golden Bear Mfg. Co.**

Russell Reinforced Plastics Corp., Lindenhurst, N. Y., has announced the addition of Billy B. Curl to their technical staff. Mr. Curl was for many years the reinforced plastics specialist at Wright-Patterson Air Force Base.

Continental Screw Co., New Bedford, Mass., announces the following changes in their personnel: **Dean B. Skillin** has been appointed sales representative for Delaware, Maryland, Pennsylvania, the District of Columbia, and the lower part of New Jersey; **Frank M. Hart**, sales representative for Indiana, Wisconsin, and the upper part of Michigan.

Sterling Electric Motors, Inc., Los Angeles, Calif., has named **Herbert F. Ziegler** manager of its Kansas City, Mo., district office located at 1207 Grand Ave.

Alsynite Co. of America, San Diego, Calif., and Portsmouth, Ohio, has opened an export division office, address of which is P. O. Box 487, White Plains, N. Y. **Vincent T. Rolon** has been appointed manager of this office.

Flambeau Plastics Corp., 501 7th St., Baraboo, Wis., has announced that **W. T. Leander**, 2312 46th St., Des Moines, Iowa, and **The Jim Ravenel Co.**, 2025 Peachtree Road, N. E., Atlanta, Ga., have been appointed as representatives for the distribution of Flambeau's plastic housewares.

Krieger Color and Chemical Co., 6531 Santa Monica Blvd., Hollywood, Calif., has announced the appointment of **E. Uhthoff y Cia, S. A.**, 168

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☐ *Poor resistance to heat, light, water and oil*

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Zacatecas, Mexico, D. F., as distributor of Krieger colorants for Mexico. **Enrique Uhthoff** is also president of Monsanto Mexicana.

Also announced is the appointment of **Larry Rudick** as technical director for Krieger. Mr. Rudick was formerly affiliated with the **Color Research Dept., Plastics Div., Monsanto Chemical Co.**, Springfield, Mass.

It is also stated by the company that **Wilmond Co., Plastics Div.**, 81 Queen St., W., Toronto, Ontario, Canada, would distribute Krieger materials in Canada.

American Resinous Chemicals and **American Polymer Corp.** have appointed **Vulcan Sales Co.**, 7014 Jarboe St., Kansas City, Mo., as agents for several midwestern states.

Dow Chemical Co. has appointed **Raymond F. Boyer**, former director of the company's Physical Research Laboratory, as manager of plastics and high polymer research. He will be succeeded in the Physical Research Laboratory by **Dr. William C. Bauman** and will replace **L. C. Chamberlain**, who has been named assistant to the director of research, **Dr. R. H. Boundy**. Mr. Boyer has been with Dow since 1935, when he graduated from Case Institute.

Monsanto Chemical Co.'s Plastics Div. sales department has announced that **Edwin V. Hellyar** has been appointed assistant sales manager of the Thermoplastic Molding Materials Dept., and that **Francis E. Woodill** has been appointed assistant sales manager for plastic sheet products. Mr. Woodill has been with Monsanto since 1928—Mr. Hellyar since 1938.

Atlas Powder Co., Wilmington, Del., has announced the opening of a new branch office in the River Oaks Building, 3272 Westheimer Rd., Houston, Texas. **Allen V. Riley, Jr.**, has been assigned as technical sales representative for this office.

Heyden Chemical Corp. executive offices have been moved to new quarters occupying the entire 16th floor in the Canadian Pacific Building, 342 Madison Ave., New York, N. Y. Heyden is also using the new offices as sales headquarters for the **American Plastics Corp.**, a subsidiary company.

Syntron Co., Homer City, Pa., manufacturer of vibratory material handling equipment, screening feeders, conveyors, etc., has organized a Canadian subsidiary, **Syntron Ltd.**, and purchased a manufacturing plant in Stoney Creek, Ontario, Canada.

Lermer Plastics, Inc., of Garwood, N. J., is a new company recently formed to specialize in plastic packaging.

Johnson Machine Works, manufacturer of closure machinery, has moved to 437 Boulevard, East Paterson, N. J., after 40 years at 251 Lee Ave., Brooklyn, N. Y.

Kilgore, Inc., is now located at Room 751, Fifth Avenue Building, 200 Fifth Ave., New York, N. Y. The manufacturing plant is in Westerville, Ohio, where the company manufactures Shel-Glo plastic housewares and toys.

Tewes-Roedel Plastics Corp., Waukesha, Wis., have announced completion of facilities to manufacture a new line of copolymer plastic tote boxes.

H. P. Smith Paper Co., Chicago, Ill., manufacturer of flexible barrier materials, has completed installation of its third coater. The new unit is capable of coating speeds up to 1000 ft. per min. with a coating thickness range from 0.0005 in. to 0.01 inch. Currently it is applying polyethylene coatings, but other types of thermoplastic resins have been successfully run. Fabric, board, and foil webs are currently being coated, as well as paper. Maximum trim is 72 inches.

Erie Resistor Corp., Erie, Pa., has announced a realinement of its industrial sales force. The company states that because of increased sales and expanding markets, it has become advisable to separate the Electronics and Plastics Divisions.

William Conroy, sales manager of the Plastics Div., announces the following line-up for his department: **Walter J. Brosman** for the Philadelphia and New York districts; **Donald A. Leet** for the Erie area; **Jack B. Leoffler** in Chicago; **Sanford W. Duncan** in Michigan; and **John Kilfoil** for Indiana and southern Ohio.

Plax Corp., West Hartford, Conn., has appointed two new New York district sales managers. **Paul Curtis** will be in charge of squeezable plastic bottles and other blownware products, and **Wallace J. Hardgrove** has been made sales manager for plastic tubing, film, and other extruded products. Both men will be in the New York office in the International Building, 630 Fifth Avenue.

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has announced that its eastern district office has been moved from New York City to 352 Cedar Lane, Peoples Trust Company Building, Teaneck, N. J.

S. L. Chambers Associates has been established to perform a converting function and to serve as a sales representative of **The B. F. Goodrich Co., Plastic Products Div.**, in the New York territory. Offices are at 11 West 42nd Street.

Reflin Co., manufacturer of Fiberglas-reinforced tubing, has doubled production capacity by moving to a new plant at 16825 So. Broadway, P. O. Box 452, Gardenia, Calif.

U. S. Polymeric Chemicals, Inc., Stamford, Conn., has ordered a second tower treater which will be running in January and will double production of the plant.

Farrel-Birmingham Co., Inc., Ansonia, Conn., has announced the transfer of **Elmer F. Myers** from the home office to become sales engineer at Fayetteville, N. C., P. O. Box 3157.

Arthur D. Little, Inc., Cambridge, Mass., has opened a mid-west office in the Railway Exchange Building, St. Louis 1, Mo.

Continental Screw Co., New Bedford, Mass., has announced the following changes in technical staff: **Harvey F. Phipard, Jr.**, will become director of research and engineering; **Edward J. Locke, Jr.**, has been appointed chief engineer; **George E. Jenney, Jr.**, has been appointed master mechanic.

Kusan, Inc., which recently suffered the fire loss of their plant, are now back on full-scale operation in a newly constructed plant in Nash-

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High-speed machine pre-heats and forms in a single operation.

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Vacuum forming is now a simple and precise operation with the new **Vacumatic Former**. It provides a fast, low-cost vacuum operation for either small or large production runs.

Utilizing the famous Fibre Glass Super-Heaters to give both speed and uniformity, the heating cycle is easily the fastest in existence.

The uniform radiant heat creates even temperatures throughout all plastic materials — without stress, strain, distortion or blushing. Hence, registration to printing is easy and exact.

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ville, Tenn. The company missed no deliveries to customers during their emergency, due largely to the transfer of work to their Henderson, Ky., plant which has been operating on a full schedule.

The Rainville Co., 53 Hilton Ave., Garden City, N. Y., is a new organization which, under the supervision of **Dewey Rainville**, will specialize in general supplies for molders and extruders. Mr. Rainville was formerly sales manager of Ball & Jewell, Inc.

Eagle Electric Mfg. Co., Inc., Long Island City, N. Y., has appointed **Brill Electric Sales**, 446 Bryant St., San Francisco, Calif., as their representative in the San Francisco area.

F. J. Stokes Machine Co. has appointed **Richard T. Voelz** and **Truman S. Brown** as representatives in their Chicago and Los Angeles sales offices, respectively.

General Industries Company, Elyria, Ohio, has appointed **Orlo W. Marsh** vice president and manager of the **Plastics Div.** His assistant, and acting as executive assistant manager, will be **William Foster**, who was formerly assistant sales manager. The new assistant sales manager is **James M. Callihan**, formerly with **Continental Can Co.'s Plastics Div.**

Superior Materials, Inc., 120 Liberty St., New York 6, N. Y., has established warehouse stock in Boston to supply the growing demand for their aluminum silicate pigments which are used as fillers in polyester plastics.

Chemical Manufacturing Co., Inc., has moved to 444 Madison Ave., New York, N. Y., from its former location at 21 West St., New York, N. Y. The company is sales agent in the United States for industrial chemicals produced by **Imperial Chemical Industries, Ltd.**, London, England.

Hercules Powder Co., Inc., has announced the following new assignments for their **Cellulose Products Div.**: **James R. Yeager**, manager lacquer promotion, Wilmington; **Philip F. Robb**, district sales manager, New York City; **Henry P. Grace**, district sales manager, Detroit; **Howard S. Lawson**, district sales manager, Cincinnati.

Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio, has announced the promotion of **George L. Smead** to manager for sales of polyester resins and fibrous glass. The new sales group is claimed to be the only one of its kind since L.O.F. is the first company offering both fibrous glass and polyester resins to the reinforced plastics industry.

Synthane Corp., Oaks, Pa., has announced the appointment of **Harry A. Weiss** to their New York district sales staff. Before joining Synthane, he represented an office machine firm.

The company has also announced that it has moved its Boston sales office to a more convenient location at 17 Taylor Building, 404 Main St., Wakefield, Mass.

EXPANSION

Durethene Corp., 1859 So. 55th Ave., Chicago 50, Ill., is building a new plant for production of polyethylene film in the airport industrial area of Los Angeles. It will be ready for production October 15, 1952. Sales and customer service for the area west of the Rocky Mountains will thereafter be handled through the Los Angeles office. **John McSparran** will be in charge of the operation.

Monsanto Chemical Co. has begun construction of its phenol plant on an 86-acre site near Avon, Calif. The new plant will be in operation by early 1954 and will be Monsanto's largest single manufacturing unit on the West Coast.

Naugatuck Chemical Div., U. S. Rubber Co., has announced that it is doubling the capacity of its facilities for the production of Vibrin polyester resins at its headquarters plant in Naugatuck, Conn.

Deceased

Lammot du Pont, 71, youngest of the three du Pont brothers, died on July 24 at his summer home on Fishers Island, N. Y. He was president of **E. I. du Pont de Nemours & Co., Inc.**, between 1926 and 1940. A famous epigram accredited to him read: "If there weren't a lot of men in the du Pont company who know more than I know, the company wouldn't last long."

T. W. Koch, director of advertising and sales promotion, **Shellmar Products Corp.**, Mount Vernon, Ohio, died Aug. 18, 1952, following a sudden heart attack. With the exception of the war years, Mr. Koch had been affiliated with Shellmar since 1929, when he joined the organization as a salesman. As a pioneer in the flexible film field he was widely known in packaging circles and in the advertising profession for his ability as a speaker and writer. He was born in St. Paul, Minn., in 1890.

John K. Johnston, vice president of National Vulcanized Fibre Co., Wilmington, Del., died on August 25, 1952. Mr. Johnston had been prominent in politics for the past 30 years, in addition to his interest in civic affairs. He was also director of sales and a member of the board of directors of the National Vulcanized Fibre Co.

MEETINGS

Oct. 28—Association of Consulting Chemists and Chemical Engineers, Inc., annual Open Door Dinner meeting, Hotel Belmont Plaza, New York, N. Y. Subject: "Cosmetics and Household Chemicals."

Dec. 4-5—Society of the Plastics Industry, Fourth Film, Sheeting and Coated Fabrics Division Conference, Commodore Hotel, New York, N. Y.

Dec. 7-10—American Institute of Chemical Engineers, Hotels Cleveland and Carter, Cleveland, Ohio.

S.P.E. Meetings

Oct. 17—Combined meeting of S.P.E. and Rubber Group of Cleveland and Akron, Ohio, at the Mayflower Hotel in Akron.

Nov. 21—A. N. Skeels, Roll Leaf Stamping Co., will address the Buffalo Section on "Marking of Plastics and Plastics Products."

Dec. 19—R. W. Powell, Hydraulic Press Mfg. Co., will deliver a talk to the Buffalo Section on "Preplasticizing."

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FOR SALE: 50 Ton Stokes Presses & Pump, 200 Ton W.S. Hobbing PRESS, 300 Ton W.S. PRESS 24 x 20 Platen, 175 Ton H.P.M. PRESS 30 x 30 Platen, 150 Ton Farrel PRESS 30 x 36 Elec. Plates. 140 Ton W.S. PRESS 23 x 17 Platens, 85 Ton Stewart Boiling PRESS 20 x 20 Platen. 50 Ton Elmes PRESS with 18 x 18 Elec. Plates. 75 Ton W.S. PRESS 15 x 15 Platen, 75 Ton Adamson PRESS 20 x 20 Platens. Laboratory presses. Accumulators. Piston and Oil Pumps. AARON MACHINERY CO., INC., 45 Crosby St., N.Y.C.

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SAVE WITH GUARANTEED REBUILT EQUIPMENT—RUBBER MIXING MILL, heavy duty 18"x48"; HYDRAULIC PRESSES: 28"x28" 18" ram, 400 tons; 36" x 36" 16" ram, multiple opening, 250 tons; 37" x 37" 30" ram, multiple opening 1060 tons; 20" x 20" 10" ram, 200 tons; 22" x 15" 8" ram, 75 tons; 14" x 14" 8" ram, 75 tons; 12" x 12" 8" ram, 75 tons; 10" x 34" 10" ram, 75 tons; 18" x 16" 7½" ram, 60 tons; 12" x 12" 7½" ram, 60 tons; 14" x 14" 8" ram, 50 tons; 12" x 12" 6½" ram, 50 tons; 8" x 9½" 4½" ram, 20 tons; 16" x 16" 3½" ram, 12 tons; LABORATORY PRESSES: 10 ton 6" x 6" Carver, 20 ton 8" x 8" Carver; NEW UNIVERSAL DUAL PUMPING UNITS; 3 to 15 HP; NEW LABORATORY MILLS & CALENDERS; EXTRUDER: Royle #1 Plastic, insulating type; ACCUMULATOR; HPM 6" ram 2500#; Preform Presses all sizes, also Mixers, Vulcanizers, Injection Molding Machines, etc. UNIVERSAL HYDRAULIC MACHINERY CO. INC., 285 Hudson Street, New York 13, N. Y.

FOR SALE: Thermex Preheater, Model 2P; Airtronics Preheater, Model D E; Airtronics Preheater, Model C R. Like new. AARON MACHINERY CO., INC., WOrth 4-8233, 45 Crosby St., New York 12, N. Y.

FOR SALE: Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars address Box 1671 Modern Plastics.

RUBBER MILLS: 2—Farrel-Birmingham 18" x 42" 13½" bearings, with a 75 H.P. sync. motor. 1—Calender 6" x 12", w.c. rolls motor driven. DALTON SUPPLY CO. 2829 Cedar St., Phila. 34, Pa.

FOR SALE: Injection Presses: 8 & 24 oz. Watson, 4, 9, 12 & 40 oz. HPM. 22 oz. Impco. 3 oz. vert. Munton. 1 oz. Van Dorn. 1—9 oz. HPM cylinder. Extruders: 2½" & 4½" NRM oil heated. 40' conveyor. 2 Scrap grinders. Ovens. 3 & 12 tons Lab presses. 150 & 250 tons transfer presses. Preform presses. No. 9 Sheridan embossing press. 42" Johnstone slitting & rewind. machine. 7½ HP Reliance Varidrive. 3 HP Gas boilers. List your surplus equipment with **us.** JUSTIN ZENNER, 823 W. Waveland Ave., Chicago 13, Ill.

FOR SALE: 16-cavity injection mold poker chip die. Practically new. Will sell reasonable. Samples on request. COLONIAL WOOD HEEL CO., 439 Washington St., Lynn, Mass.

FOR SALE: Dielectric Preheater. Thermal Super Chief Model used only a few hours. Here is an opportunity to purchase a machine with 5 pounds per minute capacity, 670 sq. in. platen area, and 1" to 4" adjusting height at the cost of a smaller machine. Write Box 1680, Modern Plastics for further information.

Six-Opening Multiple Platen Laminating Press with 26" x 44" steel platens cored for steam and water. Now operating. Excellent condition. 18" ram with quick and slow closing pumps. Can exert up to 3,000 lbs. pump pressure. Will sell. Leathertone, 260 Tremont St., Boston 16, Mass.

HERE'S YOUR STOCKPILE of Good Used Equipment: Ball & Jewell Stainless No. 1½ Rotary Cutter 40 HP; W. & P. 100 Gal. Heavy Duty Jacketed Mixers; F.B. 3 Roll Calender 18"x54"; Tray Dryers; Hammer Mills, Mikro Pulverizers, Rotex and Roball Sifter-Screens; Stokes Pre-Form Presses. FIRST MACHINERY CORP., 157 Hudson St., N. Y. 13, N. Y.

FOR SALE: 1—Ball & Jewell No. 1½ Rotary Cutter, stainless steel. 3—Mikro Pulverizers #1-SH, #2-SI, #2-TH. 2—Kux Rotary Pellet Presses. 6—Stokes Rotary Pellet Presses. Read 600 gal. Jacketed Ribbon Mixer. Large stock stainless steel tanks and kettles. PERRY EQUIPMENT CORP., 1429 N. 6th St., Phila. 22, Pa.

4—8 oz. Reed Prentice Injection presses. All only 7 years old, in excellent condition, with new cylinders and equipped with new style toggle back end. Located in Chicago. Reply Box 1687, Modern Plastics.

FOR SALE: 1—Thropp 60" Plastics Mill, watercooled bearings, with 100 HP motor; 1—Farrel 20x46 Plastics Mill, M.D.; 1—Farrel Birmingham self-contained 6x13 3 roll vertical Calender, M.D.; 1—Royle 2" oil heated Plastics Extruder; 1—Stokes R Preform Machine. Also Grinders, Extruders, Compression and Injection Molding Presses, Mixers, etc. Send us your inquiries. Consolidated Products Co., 13-14 Park Row, New York 38, N. Y.

FOR SALE: Several Cumberland Grinders. Size 0, 2 HP Motor. Will Exchange for plastic scrap. Franklin Jeffrey Corp., 1671 McDonald Ave., Brooklyn 30, N. Y. Es. 5-7943.

FOR SALE: 8 Baldwin Southwark 4-post hydraulic presses, up moving 16" rams, 7¼" stroke, daylight 25", platens 16" x 14", 100 tons at 3000 P.S.I. $650.00 EACH. Also 4 Vickers Hydraulic Units single stage 1000 P.S.I. Complete with tank, pump, and motor $450.00 each. Also one 10 HP Mears Kane gas fired boiler, 150# pressure, complete with return unit. All in excellent condition. Reply Box 1697, Modern Plastics.

FOR SALE AT TREMENDOUS SAVINGS: Colton 2 and 3 RP Rotary Tablet Machines. Mikro 1SH, 3TH, 4TH Pulverizers; Jay Bee and Schutz O'Neill Mills. Baker Perkins & Readco Heavy Duty Steam Jacketed, Double Arm 50, 100, 150 gal. Mixers. Baker Perkins 150 gal. D. A. Unidor Jacketed Mixer. Baker Perkins 100 gal. D. A. Vacuum Mixers. J. H. Day from 8 up to 75 gal. Imperial and Cincinnatus D. A. Jacketed Sigma Blade Mixers. Day & Robinson 100 up to 4000 lbs. Dry Powder Mixers. Pony ML and M Labelrites. Package Machy. FA, FA4, Miller, Haynsen 3-7, Scandia auto. Wrappers. Hudson Sharp Campbell auto cellophane Wrapper. REBUILT AND GUARANTEED. This is only a partial list. Over 5000 machines in stock—available for immediate delivery. Tell us your machinery requirements. UNION STANDARD EQUIPMENT CO., 318-322 Lafayette St., New York 12, N. Y.

FOR SALE: Buttondex machines, used but in excellent condition. Reply Box 1709, Modern Plastics.

FOR SALE: 1—Improved Hydraulic Machinery Corp. Hobbing Press; Cap. 200 Ton, Max. Lb. per Sq. In. 7000. 1—Watson Stillman horizontal 4 plunger pump, 2 pressure. Reply Box 1699, Modern Plastics.

FOR SALE: 1—New 1 oz. Vertical Sav-Way Injection Machine—5 H. P.—10 Ton. $950.00. PARKER SPECIALTIES COMPANY, 9695 Monica Ave., Detroit 4, Mich.

MACHINERY FOR SALE. 2 MacRay, 4 ounce injection molding machines. Not over 2 years old, good running condition. $4,000. each. B.B.B. PLASTIC PRODUCTS, Keyport, N. J.

FOR SALE: Hobbing Press 160 Ton Watson-Stillman. Double action hand pump. Latest model, same as new. Excellent press for die-sinking. Reasonable. DON MANNING & CO. 135 Leighton Avenue, Rochester, New York.

NEW PRINTING ROLLER—Cowhide Design. 60" diameter, never used. Still at engraver. Call Yellowstone 2-3800, ARCO PLASTICS CORP., 8-67 Astoria Blvd., Astoria, L. I., N. Y.

(*Continued on page 220*)

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Easier handling and long shelf life are only two of the many important advantages of Atlac *dry* polyester resins!

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ATLAS POWDER COMPANY, CANADA, LTD.
BRANTFORD, CANADA

CLASSIFIED ADVERTISING

(*Continued from page 218*)

MACHINERY and EQUIPMENT WANTED

WANTED 16 OZ. OR LARGER REED-PRENTICE injection molding presses. Give full particulars and price. BERNARD EDWARD COMPANY, 3332 S. Kolmar Ave., Chicago 32, Illinois.

WANTED GARDEN HOSE DIE and auxiliary equipment, Take-off, Cutting, etc. THE LAWRENCE PROCESS COMPANY, INC., 360 Merrimack Street, Lawrence, Mass.

WANTED: Plastics and Rubber Processing Machinery including Banbury Mixers, Heavy Duty mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider a set up plant now operating or shut down. When offering give full particulars. P.O. Box 1351, Church Street Sta., New York 8 N. Y.

WANTED: New or used 2½" or 3½" N.R.M. extruders. Also parts such as cylinders, etc. Reply Box 1672, Modern Plastics.

Wanted late model Reed Prentice 8, 12, 24 oz. injection machines by manufacturer of infant's items. Reply Box 1690, Modern Plastics.

MATERIALS FOR SALE

FOR SALE: 3000 pounds Flesh and Pink Butyrate Molding Powder, reground 28 cents per pound. Reply Box 1673, Modern Plastics.

VIRGIN LUCITE MATERIAL AVAILABLE 4,886 lbs.—HM 140 Clear—heat resistant—hard flow. 3,930 lbs.—HM 120 Clear—soft flow. ELDON MFG. CO., 1910 E. 62 St., Los Angeles 1, Calif. Contact J. R. Taylor.

FOR SALE: Cellulose nitrate clear film .005" (Dupont's uncoated film base), new perfect. Rolls 1010 foot long, 2-3/16" wide. 1¢ per foot in five to ten roll lots. Less in large quantities. SEAL-VIEW COMPANY, Wayne, Pa.

MATERIALS WANTED

WANTED: PLASTIC Scrap or Rejects in any form. Acetate Butyrate, Polystyrene, Acrylic, Vinyl Polyethylene, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding, magnetizing and compounding. Reply Box 1669, Modern Plastics.

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic, Ethyl Cellulose. Reply Box 1670, Modern Plastics.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate, Custom grinding, magnetizing, compounding, and straining of contaminated plastics. FRANKLIN JEFFREY CORPORATION, 1671 McDonald Avenue, Brooklyn, N. Y., ES 5-7943.

WANTED: Plastic scrap such as Cellulose Acetate, Vinyls, Acrylic, Ethyl Cellulose, Polystyrene, Butyrate, etc. We also buy surplus inventories of molding powder or grind, clean and reprocess your own scrap. CLAUDE P. BAMBERGER, INC., 152 Centre St., Brooklyn 31, N. Y., Tel. Main 5-5553. Not connected with any other firm of similar name.

WANTED: SURPLUS UREA MOLDING COMPOUNDS—ANY QUANTITY—ANY COLOR. Reply Box 1683, Modern Plastics.

MOLDS FOR SALE

FOR SALE: 4-cavity glasses case mold for polyethylene. Suitable for 8 oz. Reed Prentice machine. Mold in perfect running condition. Samples of cases on request. Reply Box 1684, Modern Plastics.

ACTIVE PROFITABLE ITEMS. Molds, assembly jigs and conveyor belt for manufacture of toy water gun; molds for 1-19 number puzzle, toy paint pallet, miniature greenhouse, boxes, trays. Reply Box 1695, Modern Plastics.

SUCKER ROD THREAD PROTECTOR COMPRESSION MOLDS for ⅝", ¾", and ⅞" Box and Pin. Will send samples of molded parts. Write to: JOHN LYMAN, 1111 Worthshire, Houston, Texas.

MOLDS WANTED

MOLD WANTED for injection molding. We will buy one mold or a complete line or series of molds for finished resaleable items. Housewares, toys, novelties, etc. Will also buy molds for industrial parts such as handles, knobs, drawer pulls, gears. All items for resale in U. S. A. Send detailed information to VICTORY MANUFACTURING COMPANY, 1722 W. Arcade Place, Chicago 12, Illinois.

WANTED MOLDS OR PRODUCTS SUITABLE FOR THE ADVERTISING SPECIALTY FIELD. Any plastic article lending itself to an imprint is of interest. We will buy molds outright or contract for quantity consumption. Send samples and details to WALDOR MANUFACTURING CO., 132 Mallory Ave., Jersey City 4, New Jersey. Telephone DElaware 2-8650.

MOLDS WANTED FOR 4 OZ. INJECTION MACHINE. We will buy, rent or contract molds for any toys, boxes, advertising specialties, industrial parts etc. All items for resale in Canada. Please send detailed information and samples. Reply Box 1706, Modern Plastics.

PLANTS FOR SALE

FOR SALE: Reasonable—Phonograph record pressing plant—6 hydraulic presses and dies—2 roller mill, blender, magnetizer-screen—and equipment for manufacturing own biscuits. Presses can be used for compression moulding. 10 miles from metropolitan area—a going business—other interests force sale. Reply Box 1679, Modern Plastics.

PLANTS WANTED

OUR CLIENT WISHES TO PURCHASE outright a Complete Injection Molding Plant, within 100 Miles of N. Y. City. Must be priced right. Write Engineers Box 1696, Modern Plastics.

WANTED: A manufacturer in midwest wishes to purchase small injection molding plant. Also interested in 6 to 9 oz. injection plastic molding machine in excellent condition. Reply Box 1698, Modern Plastics.

HELP WANTED

WANTED: Jr. Plastic Engineer for mold design and estimating. Old established Chicago concern. Give details and background. Reply Box 1674, Modern Plastics.

CUSTOM MOLDING REPRESENTATIVES: Growing Midwest Molding Company doing Injection Molding with large equipment and specializing in Kel-F and Nylon materials. Have our own tool shop and painting facilities with vacuum distillation. Must be experienced and capable of handling problems in the field. Representative required for East, South, and Near West territories. Give all qualifications in first letter. Reply Box 1705, Modern Plastics.

WANTED: PRINTING DEPARTMENT SUPERVISOR. Experienced in color matching and printing on vinyl film and coated fabrics. Good opportunity for qualified man. FEDERAL LEATHER COMPANY, Belleville 9, N. J.

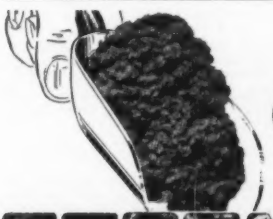
WANTED: INJECTION PLASTICS ENGINEER to take charge of engineering and manufacturing operations for a young, aggressive plastic molding organization in Virginia. Must be mechanically minded, versatile, and ambitious. Excellent opportunity. Salary and Profit Sharing. Reply Box 1676, Modern Plastics.

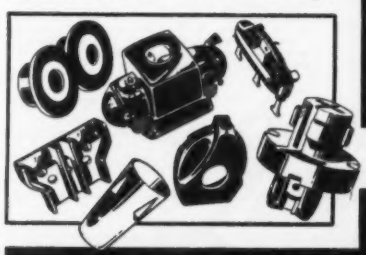
WANTED: Well established and modern injection molding company serving the midwestern area for many years plans to expand their sales department and desires the services of well established manufacturers' agents, one for Chicago area, one for Indiana-Ohio area, and one for New York area. Company has had many years experience in the manufacture of Nylon products. Reply Box 1677, Modern Plastics.

SALESMAN—for growing Florida custom fabricator and molder. Must be experienced, have sales ability in servicing industrial and consumer accounts and able to build up sales volume. Permanent. Good opportunity for hard worker. Submit complete resume qualifications, experience and references. Confidential. Reply to Box 1827, Jacksonville, Florida.

WANTED: SALES ENGINEERS, familiar with phenolic casting resins, to establish offices in Detroit, Chicago, California. Excellent opportunity for right man. State experience. All replies confidential. Reply Box 1708, Modern Plastics.

(*Continued on page 222*)





CLASSIFIED ADVERTISING

(*Continued from page 220*)

PLANT MANAGER. Must be experienced; to supervise small Vinyl, dip-mold, plastic product plant located in Los Angeles. Must know how to handle workers, plan production, layout, etc. Excellent future, salary open. Supply all details of self and experience in first letter. Reply Box 1700, Modern Plastics.

CHEMIST—Research and Development. Experienced, Vinyl Plastisol Applications, Slush Molding Experience Valuable. Old Established Company. Salary Commensurate with Experience and Ability. Reply Box 1701, Modern Plastics.

PROGRESSIVE WEST COAST MANUFACTURER requires—Chemist or chemical engineer having experience in compounding and production of PVC plastisol articles by rotational casting method. Experience in rubber technology also desirable. Write giving age, recent photo, complete educational background and industrial experience, salary requirements, etc. Reply Box 1702, Modern Plastics.

UNUSUAL OPPORTUNITY FOR PLASTICS CHEMIST for research and product development. Should be experienced in polyvinyl chloride compounding. An excellent opportunity to progress with a well established and rapidly expanding California organization having a healthy balance of government contracts and commercial business to assure excellent future prospects. Employees of this organization have knowledge of this advertisement. Give full particulars in letter—age, experience, education, references, personal history, salaries received, salary expected, and comments on willingness to move to California. Reply Box 2393 Terminal Annex, Los Angeles 54, California.

PLASTICS ENGINEER: Good experience background in extrusion of thermoplastics preferred. Must have B.S. degree. Position is for development work for large manufacturer for own production. Located midwest. Excellent working conditions. Salary commensurate with experience. Reply 1681, Modern Plastics.

PHYSICIST OR CHEMIST interested in color research and development in the plastics industry. Should have a good understanding of optics, colorimetry and spectrophotometry. Plastics experience is not necessary. Mail a complete resume of your qualifications to: Manager, Technical Personnel Employment, Monsanto Chemical Company, Springfield, Mass.

FOREMAN—INJECTION MOLDS: To supervise building injection molds in a long established tool shop, located in Central Massachusetts. Must have all the qualifications required of a good foreman. This opening offers a steady job for the right man. State age, experience, references and wages expected. Reply Box 1693, Modern Plastics.

PLASTICS TECHNICIAN: North Ga. electrical manufacturer has excellent opportunity for young man with a working knowledge of plastics using both cavity thermal and injection molds. Answer outlining complete experience. Permanent employment, established national concern, complete employee benefits. Reply Box 1707, Modern Plastics.

A medium-sized manufacturer of plastic-coated fabric is seeking a working production manager. Practical operating experience necessary. Reply Box 1675, Modern Plastics.

POLYMER CHEMIST: Position now exists in Research Department for a PhD chemist having research experience in synthetic rubbers and plastics. A good basic knowledge of both physical and organic aspects of polymers and polymerization, plus a background in fundamental research, is required. Prefer PhD up to 35 years of age. Job location is Akron, Ohio. Replies should include education with experience and salary desired. David Thomas, Sales and Office Personnel, THE GOODYEAR TIRE AND RUBBER COMPANY, 1144 East Market Street, Akron 16, Ohio.

SITUATIONS WANTED

DEVELOPMENT ENGINEER: PLASTICS APPLICATION. Fifteen years diversified experience; polyester laminates, plastisols, formulation lacquer and hot-melt coatings, resin and coatings research. Excellent mechanical aptitude, administrative ability. Ph.D. in polymer chemistry, associate editor of plastics publication. Patents. Desires position as development supervisor within 200 miles N. Y. C. Reply Box 1678, Modern Plastics.

REINFORCED PLASTICS SPECIALIST, Graduate Chemist-Engineer, presently employed as department head, seeks connection with progressive firm. Fifteen years diversified responsible technical, business experience. Well versed production techniques, new product and process development, sales engineering, chemical-mechanical trouble-shooting, automatic and semi-automatic processes. Particularly interested civilian products but well acquainted Government requirements. Age 35, family. Reply Box 1682, Modern Plastics.

EXECUTIVE AVAILABLE—15 years Experience—production, engineering, development, research plastic and metal products from mass produced toys to most accurate technical components. Intimate knowledge of product and tool design, toolmaking, materials properties compounding and formulation, processes, molding, extrusion, blowing, laminating, sheet mfg., press work, finishing, technical sales. Record of accomplishments, many patents. Graduate Engineer Age 36. Reply Box 1688, Modern Plastics.

PRODUCT-PRODUCTION ENGINEER OR PLANT SUPERINTENDENT. 7 years plastic molding supervisory experience. 3 years product development. Presently managing custom molding plant. Heavy experience in compression, transfer and injection molding of phenolics, ureas, melamines, polystyrenes, polyesters, vinyls, acetates, polythenes, fluorothenes, silicones, butyls. Some extrusion experience. Know operation and maintenance of most current molding and auxiliary equipment. Age 36, chemical engineering degree. Reply Box 1689, Modern Plastics.

VINYL CHEMIST, 30, B.S. Chemistry, married, family. 6 years experience calendering, compounding, testing film and sheeting. Fully familiar scrap reworking, colors, materials evaluation, low cost formulations. Capable mature judgment, independent action, emphasis on hard work. Desires employment with small concern where initiative may be utilized. Will relocate, consider foreign employment. Availability 3 weeks. Reply Box 1691, Modern Plastics.

SERVICES OFFERED

PLASTIC CONSULTANT, with general facilities in Washington, D. C., having years of leading experience in the Department of Defense, Munitions Board, Research and Development Board, and Navy Department, available to facilitate processing chemical and engineering phases of plastics for government requirements. Reply Box 1686, Modern Plastics.

NEW DIALLYL PHTHALATE MOLDING COMPOUNDS: Chemical Engineer with over 2 years experience in compounding and production of Diallyl Phthalate Molding Compounds exclusively, capable to set up new production facilities on short notice, offers his services to responsible company on consulting or permanent basis. References exchanged. Reply to Box 1692, Modern Plastics.

MISCELLANEOUS

WANTED MOLDED STYRENE BOX AND COVER approx. 7 in. long 3½ in. wide 1½ in. high or somewhat larger, separated into two parallel rows of compartments, each row containing 5 or 6 equal size compartments. Also, want large quantity ½-inch cubes or ½-inch extruded rod in vinyl or rubber. Address A. M. Fay, 612 N. Michigan Av., Chicago, Ill.

CHEMICAL ENGINEER, PLASTICS BACKGROUND, will organize company to extrude thermoplastics with person having extrusion experience. Will also buy active interest in existing concern in New Jersey-New York metropolitan area. Reply Box 1694, Modern Plastics.

CO-OPERATION wanted with manufacturers of plastics (household wares and novelties) with a view to exchanging tools, tool drafts, experiences etc. Plastic-machines for 40-300 gr. available. Correspondence in German preferred. ERICH SCHUMM GmbH /Murrhardt-Germany.

MR. MOLDER, join the "Bradley Box Exchange." It costs you nothing and many molders have derived thousands of dollars of business through our organization. Your entry fee is merely a sample of each molded plastic box you have available. . . . We have thousands of clients seeking molded styrene boxes for packaging and sales promotion. We now represent over 50 molders. Write today and send samples to Bradley Associates, Inc. "world's largest source for molded plastic boxes"—1652 N. Damen Ave., Chicago, Illinois.

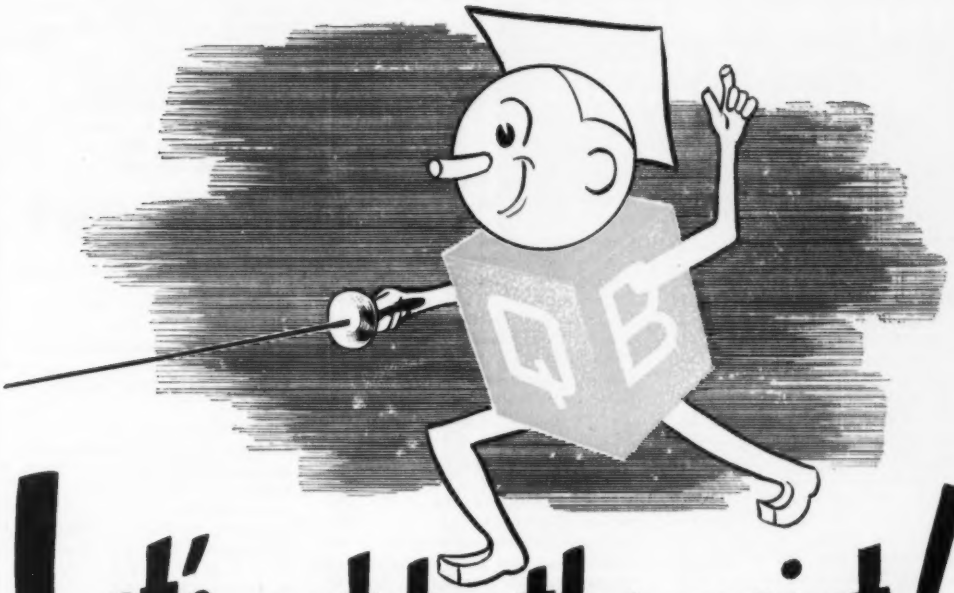
PLASTIC TECHNICAL SCHOOL, beautifully located, well equipped, 6 years old, in S.E. U.S., requiring building up. For Sale. Reasonable. Reply Box 1685, Modern Plastics.

All classified advertisements payable in advance of publication

Closing date: 5th of preceding month; e.g., October 5th for November issue

Up to 60 words $10.00	Up to 120 words $20.00	Up to 180 words $30.00
Up to 60 words (boxed) .. $20.00	Up to 120 words (boxed) .. $40.00	Up to 180 words (boxed) .. $60.00

For further information address Classified Advertising Department, Modern Plastics, 575 Madison Avenue, N. Y. 22, N. Y.



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CUBEE WANTS YOUR PLASTICS PROBLEMS . . .

Our business is producing plastics parts for manufacturers in many segments of industry . . . aviation, automotive, electrical appliances, business machines and many others. In many instances we help with the initial design of the part as well as design the molds, determine the best plastic compound and handle complete production.

All the facilities necessary are here under one roof . . . one responsibility, one control.

We have been working successfully with many manufacturers. We are certain that we can help you on your future plastics problems. Call Cubee the next time you are faced with a problem involving plastics.

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PLASTICS

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Phone—Greenfield 6-7161

H. B. COLLINS, JR.
Fairport Road
East Rochester New York
Phone—Hillside 2415-M

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Phone—Hilltop 7-0345

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INDEX OF ADVERTISERS

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MODERN PLASTICS

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19 Ways to Get Splendid CUSTOMER Reception

WMP's answers to scores of die design, material selection, moulding and finishing problems are moulded right into these 19 handsome best-sellers. To our customers, the manufacturers of these radios, this means *better* products at less cost — greater in beauty, consumer acceptance, durability and production economy.

Let WMP work with you on your injection moulding. Whatever your requirements — from small, intricate parts all the way up to giant 22½ pound mouldings, with partial or complete vacuum metallizing — you'll find the experience and facilities at WMP valuable assets to the sales success of your product. Write, phone or pay a visit to WMP in Worcester. We'll be happy to send our plane for your personal visit.

Custom Injection Moulding

WORCESTER MOULDED PLASTICS CO.

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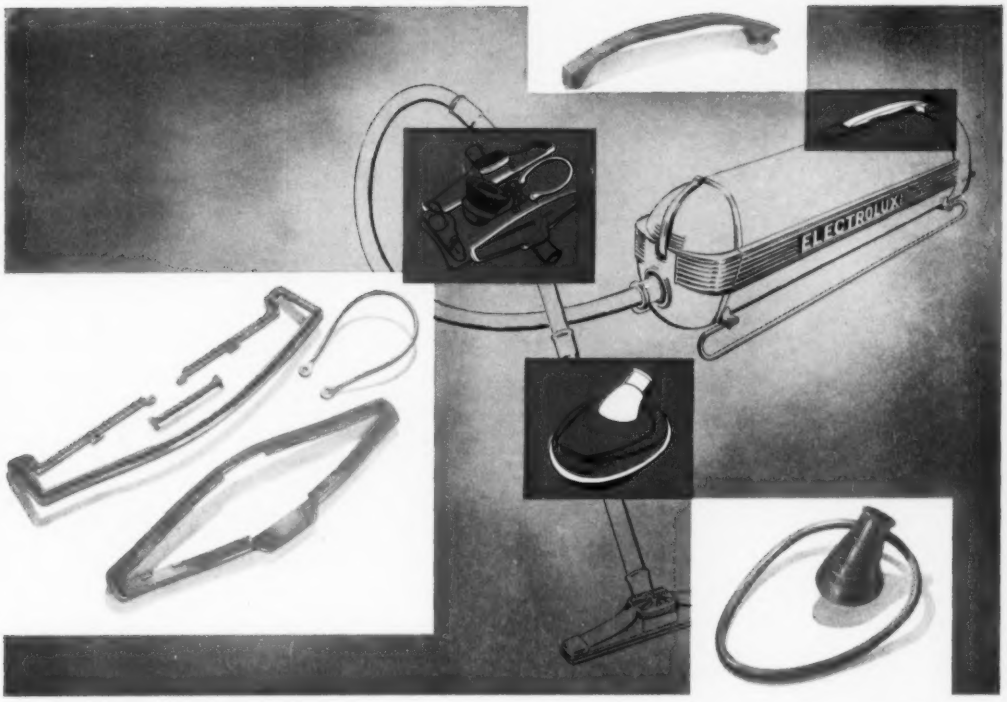
17 East 42nd St., New York 17, N. Y.



Data courtesy Hungerford Plastics Corp., Rockaway, N. J.

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with the help of VINYLITE *brand elastomeric plastics*

Strong carrying handles, tough bumpers, a pliable elbow . . . all made from VINYLITE Brand Elastomeric Plastics! They're sturdy, flexible fittings that add up to extra service for the Electrolux cleaner and polisher!

VINYLITE Elastomeric Plastics are unsurpassed for this job. Easily molded or extruded to intricate shapes and fine details, they'll bend, twist and stretch, but won't lose shape or crack. They're light in weight, resistant to water, oils, alkalies, most strong acids. Color and finish will stay fresh despite dirt, abrasion, and age.

For a combination of resilience, durability, and ease of forming, put VINYLITE Elastomeric Plastics to work. They spell plus-values for scores of products . . . like wire coatings, hose, sockets, knobs and refrigerator door gaskets, for instance. Their unique properties make them necessary to defense and basic industry. To learn how they can add to your product and subtract from your problems, write Dept. ND-7.

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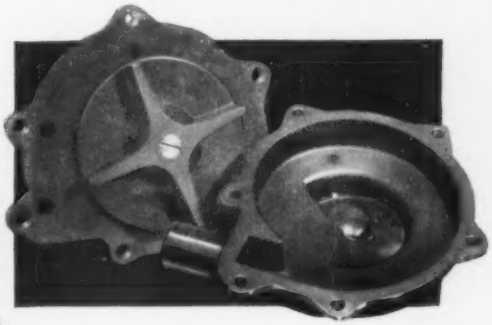
IDEAS IN PLASTICS FROM G.E.'s MOLDING SERVICE



A Plastics Pump? Yes...

It's Lighter, Quieter, Less Expensive

G.E.'s COMPLETE MOLDING SERVICE OFFERS YOU—

- Complete mold-making facilities
- Impartial material selection
- Injection presses from 3 to 208 ozs.
- Compression presses from 3 to 36 ins.
- Complete extrusion facilities
- Complete silicone rubber fabricating facilities
- Complete molded mycalex facilities

PLUS the benefit of 60 years' experience in designing, engineering and molding plastics parts.

Here's a brand-new idea in plastics from General Electric's complete molding service—a *plastics* pump! Pump parts in plastics offer many advantages: conservation of metal; light weight; relatively noiseless operation with little need for lubricants. Strong and resilient, they resist moisture and abrasion, function successfully even when high temperatures are present.

This model pump suggests new design possibilities in automatic washing machines and chemical equipment. It's just one more example of how G.E.'s *complete* molding service offers *ideas* in plastics which may help improve products or effect important economies. Ideas like this are what bring so many manufacturers to General Electric for plastics parts and services. They know that G.E.'s *complete* plastics service includes not only tremendous molding facilities but the ideas and creative "know-how" that can mean low-cost, high-quality plastics parts.

For full information about G.E.'s complete molding service, just write to General Electric Company, Section 110-4A, Chemical Division, Pittsfield, Massachusetts.

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